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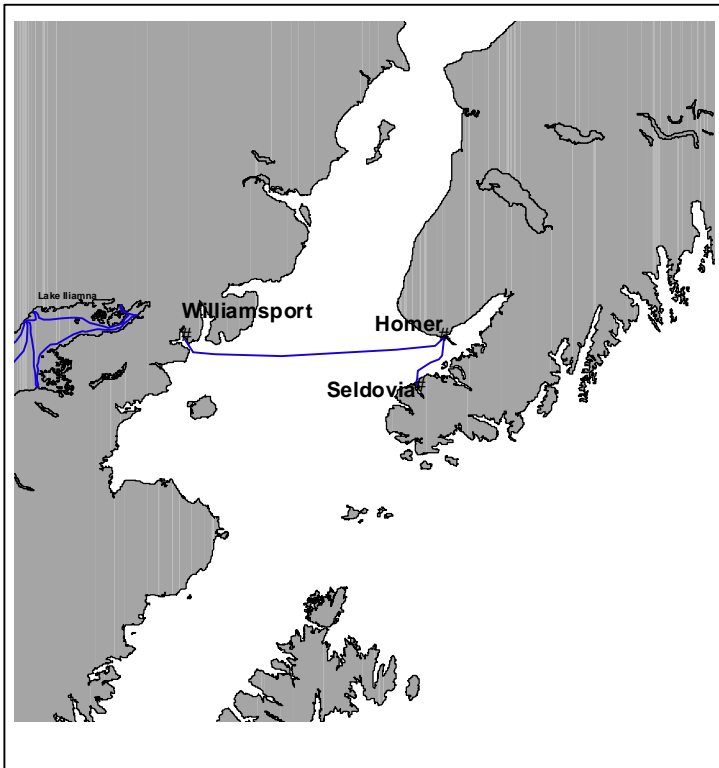
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MARINE ALTERNATIVES BEING CARRIED FORWARD FOR EVALUATION

HOMER-WILLIAMSPORT-SELDOVIA MARINE LINK



Making Regional Connections

Improvement and development of surface transportation connecting Cook Inlet and Bristol Bay has been identified as a goal for Southwest Alaska regional transportation. To accomplish this three transportation links are required: 1) a new marine transportation link operating on the Kvichak River and Iliamna Lake, that is the subject of a separate technical memorandum; 2) the existing Williamsport to Pile Bay road; and 3) a new marine service connecting Homer and Williamsport. Also, in a separate technical memorandum the possibility of dedicating the *Tustumena* to Southwest Alaska service is considered. The *Tustumena*'s current service includes operations between Homer and Seldovia, but a new vessel providing service between Homer and Williamsport could also provide service between Homer and Seldovia, thereby relieving the *Tustumena* for additional service in areas only accessible to an ocean certified vessel like the *Tustumena*. This technical memorandum is intended to explore a possible new marine service connecting Williamsport, Homer and Seldovia.

The Cook Inlet point of entry to the Kvichak River – Iliamna Lake corridor is at Williamsport. The Williamsport to Pile Bay road connects Williamsport on Cook Inlet to

Pile Bay on Iliamna Lake. Iliamna Lake is navigable by conventional marine craft during the ice free season which extends from 1 May through October 31, and potentially navigable year around by a hovercraft excepting during freezeup and spring thaw.

Iliamna Lake provides the headwaters to the Kvichak River which flows into Bristol Bay at Naknek. While the lower reaches of the Kvichak River are navigable during the ice free season the upper reaches of the river are subject to seasonal low water that could impact the navigability for some conventional vessels.

Existing Conditions

Based on the "AMHS 1997 Annual Traffic Volume Report" the *Tustumena* made the *Tustumena* made 58 trips to Seldovia (*Tustumena* made 73 arrivals at Homer during 1997 from either Kodiak or Port Lions). The proposed new ferry linking Homer and Williamsport could provide service linking Seldovia and Homer with equal or greater frequency of service and capacity when compared to the service currently provided by the *Tustumena*. Accordingly an assumption for the purposes of this technical memorandum is that the *Tustumena* will cease to be the vessel providing ferry service between Seldovia and Homer if and when a new ferry is provided that also links Williamsport to Homer.

As described above, it is presumed that service between Seldovia and Homer will be assumed by a new ferry also providing service between Homer and Williamsport. The historical level of service to Seldovia that should be equaled or exceeded is summarized in Table 1.

Table 1
1997 *Tustumena* Service Between Seldovia and Homer

Seldovia and Homer										
	Passengers			Vehicles			Trips	Link	Vessel	Transit
	Count	Miles	Capacity Ratio	Count	Miles	Capacity Ratio		Length (n.m.)	Miles	Hours
Homer – Seldovia	2,303	39,151	18.9%	878	14,926	43.9%	58	17	986	73.0
Seldovia - Homer	2,187	37,179	17.9%	827	14,059	41.2%	58	17	986	73.0
Total	4,490	76,330		1,705	28,985		116		1,972	146

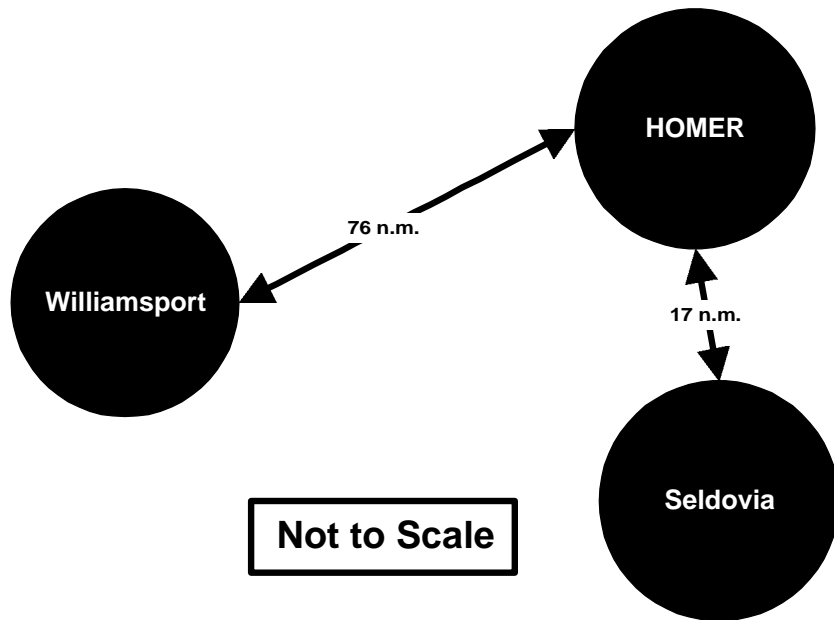
The Project

Homer and Seldovia are located on the southern Kenai Peninsula and Williamsport is located on the Alaska Peninsula approximately due west of Homer across lower Cook Inlet. Homer is situated on Katchamak Bay and Seldovia is located on Seldovia Bay on the opposite side of Katchamak Bay. Williamsport is located off of Iliamna Bay.

Figure 1
Location Map for Williamsport, Homer, and Seldovia



Figure 2
Williamsport-Homer-Seldovia



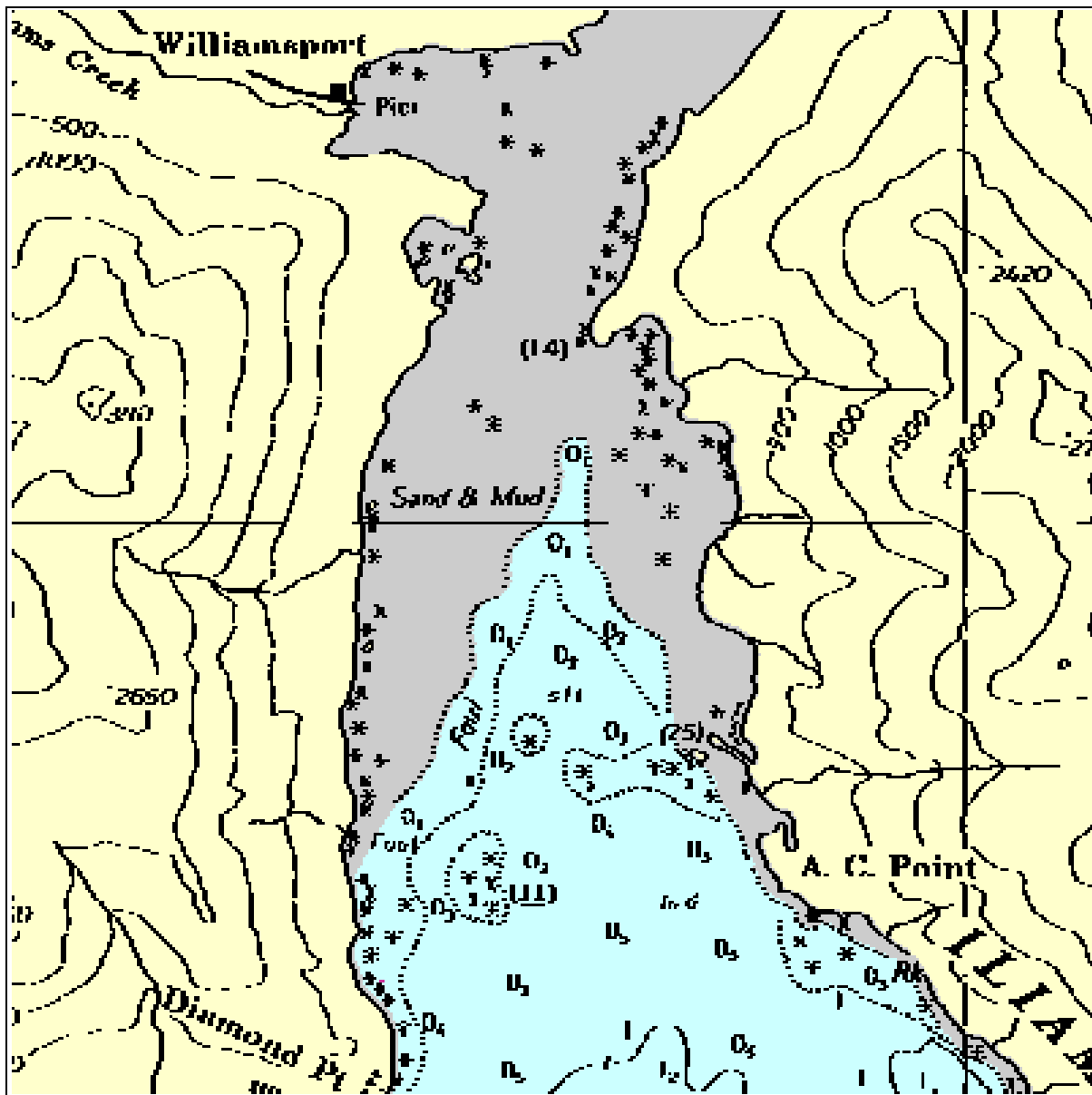
Williamsport - Homer - Seldovia

The run between Williamsport and Homer crosses lower Cook Inlet. This area is noted for steep seas, strong currents, and winter ice floes.

Operational Issues

Williamsport: As shown in Figure 1, Williamsport is located at the head of tide flats that go dry at low water. Numerous rocks dot the shoal water approaches to Williamsport. It is approximately ≥ 1.5 n.m. from the beginning of the tide flats to the Williamsport pier. Calling vessels must be either shallow draft or a channel must be dredged. Shallow draft vessels could (presumably) call briefly at high tide.

Figure 3
Navigation Chart for Williamsport in Iliamna Bay



The U.S. Coast Pilot states that “Williamsport, in a cove on the west shore of Iliamna Bay 1 mile from the north end of the bay, is the east terminus of a 15.5-mile, State-maintained, gravel road between Williamsport and Pile Bay. The road is open from June to October.”

“Vessels less than 12 feet wide, 32 feet long, and 9½ feet high are hauled, by truck, between Williamsport and Pile Bay. From Pile Bay the vessels transit Lake Iliamna to the Kvichak River and down the river to Bristol Bay. The controlling depth in the river was reported to be 3 feet in 1973. This depth may be more or less, depending on the runoff.”

“A trail leads from the road between Williamsport and Pile Bay to the abandoned village of Old Iliamna on the Iliamna River.”

“Williamsport consists of a house, boat ramp, and wharf. The base of the wharf and boat ramp dry before low water. The wharf has a 50-foot face and dries 12 feet. ... Because of working limitations and tides, boats sometimes have to wait to be hauled out.”

“The diurnal range of tide is 14.5 feet in lower Iliamna Bay. The currents just inside the entrance have an estimated strength of 1 to 2 knots.”

Williamsport Port Improvements: The following is excerpted from a letter report from Ogden Beeman & Associates, Inc., dated 10 August 1998:

“From topographic maps of the area, the approach to Williamsport crosses over a mile of tidal flats. In Iliamna Bay, the average mean high tide is 14.5 feet with an average range of 12.3 feet.”

“From contacts with the U.S. Army Corps of Engineers in Anchorage, the Corps performed a feasibility level study on a dredging project at Williamsport a few years ago, but they do not have any active work ongoing there. The dredged channel proposed in the study was 100 feet wide to a depth of –1.6 feet MLLW to allow barges and fishing vessels access to Williamsport. A map of the proposed project is included to provide additional information.”

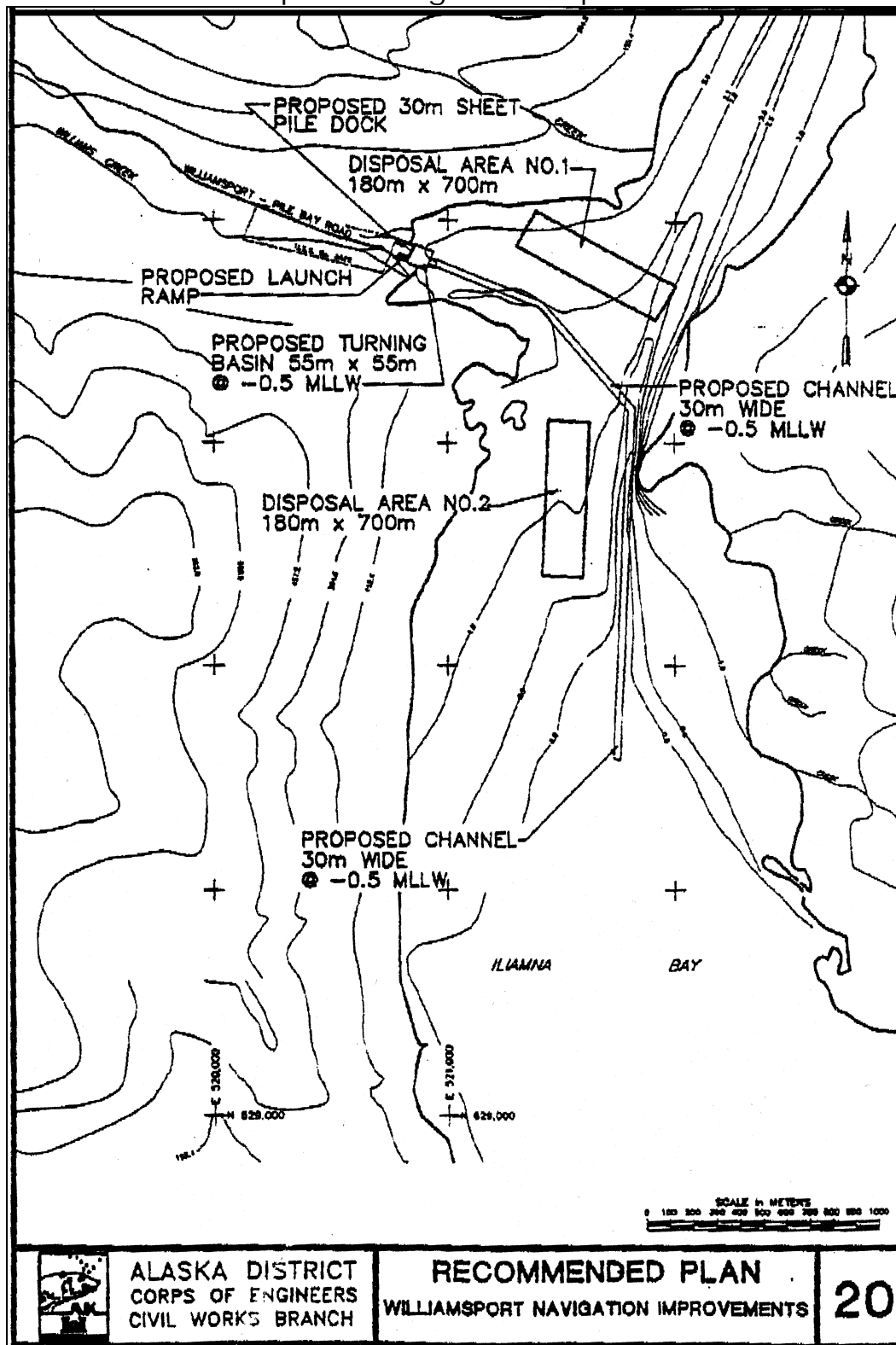
“Hydrographic surveys conducted during the Corps’ study revealed meandering channels and large boulders in the tidal flats. Across the tidal flats, the natural depth varied from +1 to +10 feet MLLW.”

“While the Corps’ study determined that dredging a channel to Williamsport would be a worthwhile project, the lack of a local sponsor terminated further work on the project. The Corps indicated that the project could proceed if local sponsor, such as the State of Alaska, was located.”

“Due to the variations across the tidal flats, only a few feet of water are available in some locations at high tide with boulders also making vessel transit difficult.”

The U.S. Army Corps of Engineers prepared a report titled “Navigation Channel Feasibility Report and Environmental Assessment,” dated December 1995 and marked “FINAL”. That report recommended excavation of a channel 2,700 meters (m) long in Iliamna Bay. The channel bottom would be 30 m wide at 0.5 m below Mean Lower Low Water (MLLW). The channel would end at Williamsport with a turning basin, 5 m long and 55 m wide. The turning basin would provide access to a recommended sheet-pile bulkhead dock, 30 m long, and an adjacent paved launch ramp 8 m wide. The recommended plan would cost \$3,822,000 (presumably 1995 dollars) to construct and an average \$185,000 per year to maintain. This maintenance cost includes annual grading of the dock, ramp, and staging area; annual surveys the first 4 years, then every 5 years; maintenance dredging every 5 years; replacement of fender piles, ramp concrete, and sheet-pile cathodic protection every 10 years; and replacement of the sheet pile after 30 years. The Army Corps report concluded that “Average annual benefits exceed average annual costs by a ratio of 3.1 to 1.” Of the \$3,822,000 construction cost Federal funding in the amount of \$1,691,400 was identified as available leaving \$2,130,600 to be funded from non-federal sources.

Figure 4
Williamsport Navigation Improvements



Homer: The AMHS ferry *Tustumena* currently calls at the Homer City Pier located at the end of Homer Spit. A landing craft style vessel such as here considered could call at the boat ramp located in the Homer small boat harbor, protected by a breakwater and located just northwest of the City Pier. The small boat basin is owned by the State and operated by the city.

The diurnal range of tide at Homer is 18.1 feet.

Seldovia: Seldovia is located on the east side of Seldovia Bay. Seldovia has three piers and a small boat harbor. The small boat harbor is about 0.2 mile south of the City Pier and is protected by breakwaters. The navigation chart shows a boat ramp though the ramp is not mentioned in the U.S. Coast Pilot. The small boat basin is owned by the State and operated by the city.

The diurnal range of tide at Seldovia is 17.8 feet.

Vessel

A representative, or basis, vessel was chosen for the purposes of this report. This vessel is a commercial design (versus military) currently operating in Alaska and having the following characteristics (see Figure 5).

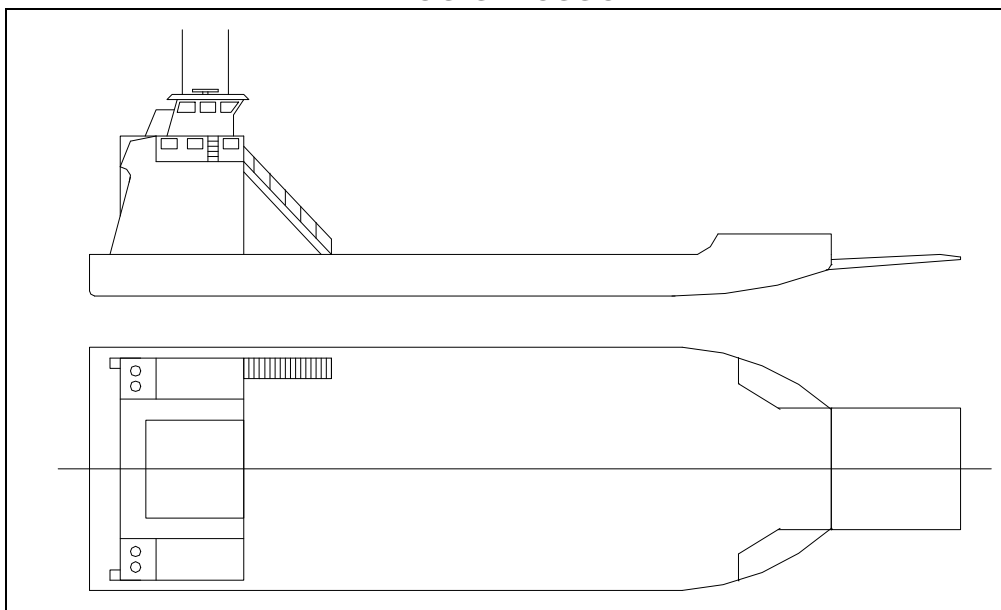
• Length, overall	150'-6"
• Length, waterline	140'-7"
• Beam	47'-0"
• Depth	8'-0"
• Draft	3'-9" to 6'-0"
• Speed, cruising	9 knots
• Passenger capacity	49
• Crew	4 people
• Installed propulsion power	1,000 BHP
• Vehicles/container capacity	190 LT
• Passenger vehicles	20
• Trucks or buses	8

The operating environment across lower Cook Inlet demands that the vessel be safely navigable in high winds, seas, spray icing conditions and sea ice. Although the basis vessel, and others of this type, have extensive operational experience in Alaskan waters, there are some design enhancements that should be considered:

- Minimum ice strengthening (ABS Ice Class A0).
- Additional, or expandable, passenger capacity to 150. This may be accomplished by using containerized passenger vans, installed as portable units as needed during peak demand periods.
- Increased freeboard and bulwark height (39" on the basis vessel) to provide additional weather protection for vehicles and passengers on the main deck.

The basis vessel is illustrated in Figure 5.

Figure 5
Basis Vessel



The basis vessel, the *M/V Nunaniq*, provided service under contract between 25 June 1991 and 19 August 1991 as a substitute for the *M/V Tustumena*.

Conceptually, loading and unloading can be easily and safely accomplished without additional shore facilities, provided a suitably sloped beach area with road access is available. The basis vessel, during the time it replaced the *Tustumena*, utilized beach and boat ramp loading and unloading and made twenty trips calling at both Homer and Seldovia.

The basis vessel is triple screw. This allows shallow draft operation (due to smaller propeller diameters), excellent maneuverability and redundancy with little loss of maneuverability in the event of one main engine/shaft line failure.

This vessel, with minimal ice strengthening, is operable in relatively light ice conditions (6" to 12" of "first year" ice). The large beam allows the outboard propellers to be set well inboard of the vessel side, thus providing good protection to the propellers from ice ingestion.

A vessel of this type can easily meet 46 CFR Subchapter T (U.S. Coast Guard regulations governing small passenger vessels) for both intact and damaged stability. Hull subdivision resulting in one-compartment flooding capacity can be easily configured. The basis vessel complies with Subchapter T requirements.

The vessel will require American Bureau of Shipping classification for Ocean service and a light ice class, such as ABS Ice Class A0.

Model Schedule

Due to the physical laws regarding resistance of displacement vessels conventional monohull ferries with length on the order of 150 feet are limited to speeds between 9 and 12 knots. Even at twelve knots the 152 n.m. round trip between Homer and

Williamsport would require more than twelve hours for transit alone (without allowance for port time, startup or shutdown). Therefore U.S. Coast Guard manning regulations will require manning for two watches. Furthermore, the shallow water and dredged channel at Williamsport probably make it prudent to time trips to match the tide at Williamsport. This suggests that one round trip between Homer and Williamsport can be scheduled in any twenty-four hour period, but the timing of departures and arrivals would vary from day to day depending on the tide. Based on a 9 knot service speed (and allowing one-half hour for morning startup and one-half hour for evening shutdown) the service day for a Homer – Williamsport round trip will take about eighteen hours as follows:

Table 2
Homer–Williamsport Round Trip
(Excluding Startup and Shutdown)

	2400 hour clock		Decimal Hours			
	Arrive	Depart	Transit Duration	Port Time	Link Duration	Cumulative Duration
Homer		0000 hrs			0.0 hrs	0.0 hrs
Williamsport	0830 hrs	0930 hrs	8.5 hrs	1.0 hrs	9.5 hrs	9.5 hrs
Homer	1800 hrs		8.5 hrs		8.5 hrs	18.0 hrs

Note: Allow one-half hour for morning startup (including loading) and one-half hour for evening shutdown (including discharge).

This 18-hour service day allows six hours in any 24-hour –day to adjust for the tide.

If the high-speed landing craft option is selected for the Kvichak River –Iliamna Lake service then Pile Bay would receive a call from that vessel every other day during the open water season on Iliamna Lake. That service could then be coordinated with the Homer – Williamsport service if the Homer – Williamsport service were provided every other day also. On the days when the Homer – Williamsport service is not provided the vessel could run between Homer and Seldovia, providing two round trips in a twelve-hour service day.

If the vessel selected for the Kvichak River-Iliamna Lake service is a hovercraft then Pile Bay could receive daily hovercraft service except during freezeup and spring breakup. However, it is recommended that the service between Homer and Williamsport only be provided every other day in any event, so that the ferry can also provide service between Homer and Seldovia on alternating days.

If the high-speed landing craft option is selected for the Kvichak River–Iliamna Lake service, then there will be no service on Iliamna Lake to Pile Bay during the winter when the lake is frozen. The period when the lake is frozen is typically from 1 November through 30 April. If there is no connecting surface transportation on Iliamna Lake then it could be questioned whether there would be sufficient service demand to justify ferry operations to Williamsport during the winter season.

Table 3
Homer-Seldovia Round Trip
(Excluding Startup and Shutdown)

	2400 hour clock		Decimal Hours			
	Arrive	Depart	Transit Duration	Port Time	Link Duration	Cumulative Duration
Homer		0600 hrs			0.0 hrs	0.0 hrs
Seldovia	0800 hrs	0900 hrs	2.0 hrs	1.0 hrs	3.0 hrs	3.0 hrs
Homer	1100 hrs	1200 hrs	2.0 hrs	1.0 hrs	3.0 hrs	6.0 hrs
Seldovia	1400 hrs	1500 hrs	2.0 hrs	1.0 hrs	3.0 hrs	9.0 hrs
Homer	1700 hrs		2.0 hrs		2.0 hrs	11.0 hrs

Note: Allow one-half hour for morning startup (including loading) and one-half hour for evening shutdown (including discharge).

Using this model schedule the vessel could serve Williamsport on seven days in a two-week period and Seldovia on the other seven days.

Table 4
Bi-Weekly Service Program

Week #1			Week #2	
Monday	Williamsport		Monday	Seldovia
Tuesday	Seldovia		Tuesday	Williamsport
Wednesday	Williamsport		Wednesday	Seldovia
Thursday	Seldovia		Thursday	Williamsport
Friday	Williamsport		Friday	Seldovia
Saturday	Seldovia		Saturday	Williamsport
Sunday	Williamsport		Sunday	Seldovia

In a 44 week service year the vessel would call at Williamsport 154 times and at Seldovia 308 times. This would represent a 530% increase in number of AMHS vessel calls at Seldovia.

Table 5
Seldovia Service Comparison

	<i>Tustumena</i>	New Vessel	Historical Demand
Annual Trips	58	308	
Annual Passenger Capacity	12,760	15,092	2,303
Annual Vehicle Capacity	3,132	6,160	878

Note: Annual capacities and historical demand are stated on a one-way basis. Two-way capacities are exactly twice the one-way capacities. One-way historical demand is the larger of the historical demand values from either the Homer – Seldovia or the Seldovia – Homer trip directions.

As shown in Table 5, on an annual basis this new vessel operating according to this model schedule would provide Seldovia with 118% of the passenger capacity and 197% of the vehicle capacity of the current service by the *Tustumena*.

Costs

Capital, operating and life-cycle costs are estimated for the basis vessel operating according to the model schedule.

CAPITAL COSTS

The construction cost of a new vessel similar to the basis vessel is estimated in the range of \$2.5 to \$3.0 million. The cost range is influenced by classification and regulatory requirements, extent of outfitting, delivery voyage costs and acquisition scheme.

OPERATING COSTS

Operating costs are estimated for the basis vessel operating in accordance with the model schedule.

Crew Costs

Table 6 shows current (1998) compensation rates as negotiated between AMHS and the Inland Boatman's Union (IBU); Masters, Mates and Pilots Union (MMP); and the Marine Engineer's Benevolent Association (MEBA). Hourly base rates are for Alaska resident crew. In accordance with advice received from AMHS benefits are shown as 38% of base pay rates. This benefits allowance includes the effect of paid leave. Daily rates assume twelve paid hours per day.

Table 6
Crew Compensation Rates by Position

Position	Hourly Base	Benefits	COLA	Total Hourly	Daily
Master	\$18.08	\$6.87	\$3.62	\$28.57	\$342.84
Ch. Mate	\$16.01	\$6.08	\$3.20	\$25.29	\$303.48
2nd Mate	\$15.45	\$5.87	\$3.09	\$24.41	\$292.92
Ch. Engineer	\$17.61	\$6.69	\$3.52	\$27.82	\$333.84
1st Asst. Engr.	\$16.36	\$6.22	\$3.27	\$25.85	\$310.20
A.B.	\$14.12	\$6.57	\$3.17	\$23.86	\$286.32
Watchman	\$13.23	\$6.16	\$2.98	\$22.37	\$268.44
Cook	\$13.82	\$6.44	\$3.13	\$23.39	\$280.68

For the basis vessel a single watch comprises a crew of four to six in unrestricted service. As previously observed the round trip for the Homer – Williamsport service exceeds twelve hours so two watches are required. For a passenger vessel (without passenger berthing or staterooms) operating in hours of darkness a watchman is required¹. Given a round trip voyage duration of seventeen hours a cook may well be required by the labor unions to prepare meals for the crew. Additionally there is a need to provide food service to passengers. The possibility exists that the Master could stand one of the bridge watches, but this is not a certainty. Fiscal prudence suggests that the deck officer complement consist of the Master and two watch standing Mates. It is assumed that the Chief Engineer stands a watch. Thus the crew of for the Homer – Williamsport service could consist of nine persons as indicated in Table 7.

The column for 154 paid days corresponds to every other day service to Williamsport over a 44 week service season. The column for 308 paid days corresponds to two paid watches on each of the 308 service days in a 44 week service season.

¹ Under some circumstances this requirement may be waived. Provision of fire detection and security surveillance features in the passenger spaces may contribute towards a waiver.

Table 7
Crew Costs in Homer–Williamsport Service

Position	No.	Daily	154 Days	308 Days (44 Weeks)
Master	1	\$342.84	\$52,797	\$105,595
Ch. Mate	1	\$303.48	\$46,736	\$93,472
2 nd Mate	1	\$292.92	\$45,110	\$90,219
Ch. Engineer	1	\$333.84	\$51,411	\$102,823
1 st Asst. Engr.	1	\$310.20	\$47,771	\$95,542
A.B.	2	\$572.64	\$88,187	\$176,373
Watchman	1	\$268.44	\$41,340	\$82,680
Cook	1	\$280.68	\$43,225	\$86,449
Total	9	\$2,705.04	\$416,576	\$833,152

When operating between Homer and Seldovia it should be possible to reduce the crew to six for a 12-hour service day. Table 8 indicates the possible minimum crew costs that might be associated with this service.

Table 8
Minimum Crew Costs in Homer–Seldovia Service

Position	No.	Daily	154 Days	308 Days (44 Weeks)
Master	1	\$342.84	\$52,797	\$105,595
Ch. Mate	1	\$303.48	\$46,736	\$93,472
Ch. Engineer	1	\$333.84	\$51,411	\$102,823
A.B.	2	\$572.64	\$88,187	\$176,373
Cook	1	\$280.68	\$43,225	\$86,449
TOTAL	6	\$1,349.28	\$207,789	\$415,578

The acquisition cost for the Williamsport–Homer–Seldovia ferry is between \$2.5 M and \$3.0 M, exclusive of any shoreside or port improvements. Table 9 summarizes the annual operating costs for service according to the model schedule. Annual operating costs are between \$1.63 M and \$1.69 M. Using a discount rate of $i=7\%$ the 20-year life cycle cost is between \$21.0 M and \$22.1 M (1999 dollars). And the equivalent uniform annual cost is between \$1.86 M and \$1.95 M (1999 dollars).

Table 9
Acquisition, Operating and Life-Cycle Cost Summary
for Williamsport–Homer–Seldovia Ferry

	Minimum	Maximum
Vessel Acquisition Cost	\$2,500,000	\$3,000,000
Subtotal: (Acquisition Cost)	\$2,500,000	\$3,000,000
Hull Maintenance & Pass. Services Maint.	\$36,000	\$44,000
Machinery Maintenance	\$128,000	\$156,000
Crew	\$698,932	\$833,152
Fuel	\$159,000	\$194,000
Lubricating Oil	\$3,600	\$4,400
Ports and Terminals O.H.	\$223,176	\$223,176
Management O.H.	\$366,741	\$366,741
Shoreside O.H.	\$69	\$69
Insurance	\$19,000	\$23,000
Subtotal: (Annual Operating Cost)	\$1,634,518	\$1,688,694
20 Year Life Cycle Cost (i=3%)		
Present Value	\$21,028,234	\$22,142,352
Uniform Equivalent Annual Cost	\$1,855,063	\$1,953,357

Operating costs shown in Table 9 are consistent with the operating cost analysis given in the “Juneau Access Marine Alternatives Study,” March 1999, prepared for Alaska DOT&PF by The Glosten Associates, Inc. Overhead costs for: i) ports and terminals; ii) management; and iii) shoreside, are based on fiscal year 1998 vessel operating costs provided by AMHS². Overhead costs in Southwest Alaska were pro-rated according to vessel operating hours.

ANNUAL COST BY LINK

Table 10 presents the annual cost of the Williamsport–Homer–Seldovia ferry service by link, apportioned to each link according to annual vessel link miles.

² Fiscal year 1998 vessel operating cost spreadsheet “Fy98_vsl.xls” prepared by B. Braley, dated 10/15/98.

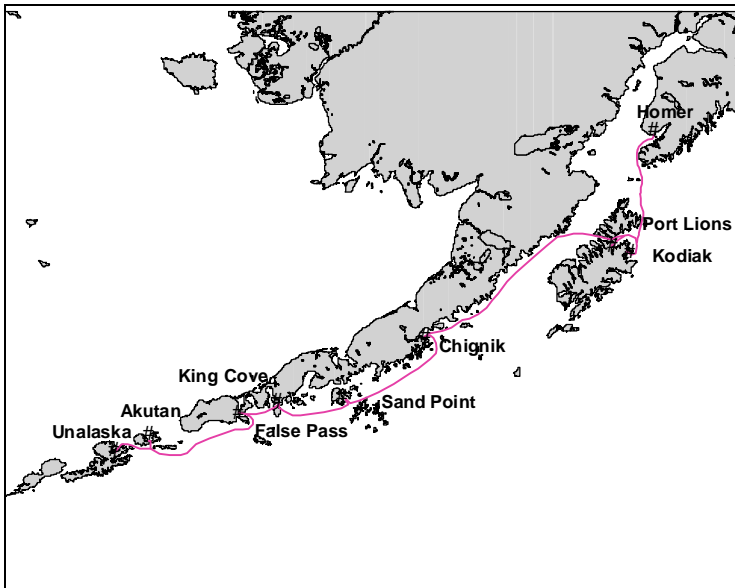
Table 10
Williamsport-Homer-Seldovia Ferry Service –
Annual Cost by Link

Annual Operating Cost Pro-Rated by Vessel Miles				
	Trips	Link Length (n.m.)	Vessel Miles	Cost
Homer – Williamsport	154	76	11,704	\$583,367
Williamsport – Homer	154	76	11,704	\$583,367
Homer – Seldovia	308	17	5,236	\$260,980
Seldovia – Homer	308	17	5,236	\$260,980
Total (44 week service year)	924		33,880	\$1,688,694

Estimated Demand

Demand for this marine link is estimated at 8,200 passenger trips per year and 2,800 vehicles per year.

DEDICATED *TUSTUMENA* MARINE LINK



Making Regional Connections

The Southwest Alaska communities located on the southern side of the Alaska Peninsula and on Kodiak Island are desirous of and needful for improved marine transportation services. The communities on the southern side of the Alaska Peninsula currently receive about seven trips per year by the *Tustumena*. The roadless coastal communities of Kodiak Island currently receive no ferry service. The *Tustumena* and the *Kennicott* are currently the only vessels owned and operated by AMHS with the U.S. Coast Guard ocean certification necessary to serve these communities. The *Kennicott* is currently programmed with a primary mission as a Southeast Alaska mainline vessel with a secondary mission to replace the *Tustumena* during the *Tustumena*'s annual maintenance period. The *Kennicott* also provides service approximately once a month across the Gulf of Alaska, connecting Southeast Alaska with Prince William Sound and the Kenai Peninsula. It is unlikely that any significant increase in *Kennicott* availability for service to Southwest Alaska will develop during the planning period under consideration.

On the other hand, the *Tustumena* currently expends 25.6% of its annual vessel miles and approximately 27.4% of its annual operating time in service to Prince William Sound. A separate transportation planning process for Prince William Sound has identified that future Prince William Sound marine transportation needs may be better met by new day boats, provided either by higher speed conventional monohulls or modern high-speed vessels. If such improvements were implemented for Prince William Sound the *Tustumena* should become available for increased service in the Southwest Alaska region.

This technical memorandum aims to explore the possible service improvements in the Southwest Alaska region that might accrue from dedicating the *Tustumena* to Southwest Alaska service exclusively.

The broad concept behind this alternative would be to take the *Tustumena* out of service in Prince William Sound and dedicate her to service in Southwest Alaska. Desire for improved AMHS service to the region has been expressed through the Southwest Alaska Transportation Plan Advisory Committee and through resolutions issued by the Southwest Alaska Municipal Conference. In light of concurrent regional planning efforts in Prince William Sound, which currently shares *Tustumena* service with Southwest Alaska, such an initiative may soon be feasible insofar as alternatives being considered in Prince William Sound include new vessels, which would free the *Tustumena* up for additional service within Southwest Alaska.

Two variations on the theme of a dedicated *Tustumena* are presented herein: (A) a service schedule that would make two trips every four weeks to the Aleutians; and (B) a service schedule that would make one trip to the Aleutians. Under Option A, Kodiak would on average receive service every third day, and the Alaska Peninsula and the Aleutians would receive service twice a month. Under Option B, Kodiak would still receive service approximately every third day, but the Alaska Peninsula and the Aleutians would receive service once a month. These cost estimates for each of these options are very different.

OPTION A

(TWO TRIPS TO ALEUTIANS PER FOUR WEEK CYCLE)

The Southwest Alaska communities located on the southern side of the Alaska Peninsula and on Kodiak Island need and desire improved marine transportation services. The communities on the southern side of the Alaska Peninsula currently receive about seven trips per year by the *Tustumena*. The *Tustumena* and the *Kennicott* are currently the only vessels owned and operated by AMHS with the U.S. Coast Guard ocean certification necessary to serve these communities. The *Kennicott* is currently programmed with a primary mission as a Southeast Alaska mainline vessel with a secondary mission to replace the *Tustumena* during the *Tustumena*'s annual maintenance period. The *Kennicott* also provides service approximately once a month across the Gulf of Alaska, connecting Southeast Alaska with Prince William Sound and the Kenai Peninsula. It is unlikely that any significant increase in *Kennicott* availability for service to Southwest Alaska will develop in the foreseeable future.

On the other hand, the *Tustumena* currently expends 25.6% of its annual vessel miles and approximately 27.4% of its annual operating time in service to Prince William Sound. A separate transportation planning process for Prince William Sound has identified that future Prince William Sound marine transportation needs may be better met by new day boats, provided either by higher speed conventional monohulls or modern high-speed vessels. If such improvements were implemented for Prince William Sound, then the *Tustumena* could become available for increased service in Southwest Alaska.

This technical memorandum explores possible service improvements in the Southwest Alaska region that might accrue from dedicating the *Tustumena* to Southwest Alaska service exclusively, including, in particular, a substantial increase in service to the southern coastal communities of the Alaska Peninsula and the Aleutian Island out to Unalaska.

Existing Conditions

Based on the "AMHS 1997 Annual Traffic Volume Report," the *Tustumena* made 699 trips in 1997 while traveling 64,109 nautical miles. She carried 34,854 passengers and 12,588 vehicles in 1997. The distribution of 1997 *Tustumena* service is summarized in the Table 11, Table 12, Table 13 and Table 14.

Table 11
1997 *Tustumena* Service Summary in Prince William Sound

Prince William Sound										
	Passenger			Vehicles				Link	Vessel	Transit
	Count	Miles	Capacity Ratio	Count	Miles	Capacity Ratio	Trips	Length (n.m.)	Miles	Hours
Chenega-Cordova	100	9,700	5.2%	69	6,693	23.5%	9	97	873	64.7
Chenega-Seward	44	2,552	2.6%	67	3,886	28.8%	8	58	464	34.4
Chenega-Valdez	1,155	100,485	42.3%	338	29,406	69.8%	13	87	1,131	83.8
Cordova-Chenega	45	4,365	3.0%	67	6,499	33.0%	7	97	679	50.3
Cordova-Seward	97	13,968	3.8%	74	10,656	21.0%	12	144	1,728	128.0
Cordova-Tatitlek	567	28,350	20.7%	186	9,300	38.0%	13	50	650	48.2
Cordova-Valdez	954	70,596	13.7%	207	15,318	17.1%	33	74	2,442	180.9
Seward-Chenega	1,252	72,616	25.9%	412	23,896	49.3%	23	58	1,334	98.8
Seward-Cordova	85	12,240	3.6%	78	11,232	21.9%	11	144	1,584	117.3
Tatitlek-Cordova	432	21,600	17.1%	102	5,100	21.7%	12	50	600	44.4
Tatitlek-Valdez	549	12,078	20.1%	187	4,114	38.2%	13	22	286	21.2
Valdez-Cordova	1,056	78,144	14.7%	244	18,056	21.0%	34	74	2,516	186.4
Valdez-Seward	1,092	157,248	40.0%	326	46,944	64.9%	13	144	1,872	138.7
Valdez-Tatitlek	399	8,778	15.8%	97	2,134	20.3%	12	22	264	19.6
Total	7,827	592,720		2,454	193,234		213		16,423	1,217

Table 12
1997 *Tustumena* Service Summary for
Kenai Peninsula and Kodiak Island

Kenai Peninsula and Kodiak Island										
	Passenger			Vehicles				Link	Vessel	Transit
	Count	Miles	Capacity Ratio	Count	Miles	Capacity Ratio	Trips	Length (n.m.)	Miles	Hours
Homer-Kodiak	3,043	413,848	39.1%	932	126,752	70.7%	37	136	5,032	372.7
Homer-Port Lions	2,305	308,870	30.4%	927	124,218	71.4%	36	134	4,824	357.3
Homer-Seldovia	2,303	39,151	18.9%	878	14,926	43.9%	58	17	986	73.0
Kodiak-Homer	3,101	421,736	37.8%	870	118,320	60.7%	39	136	5,304	392.9
Kodiak-Port Lions	1,780	85,440	24.9%	718	34,464	56.7%	34	48	1,632	120.9
Kodiak-Seward	1,717	317,645	23.3%	806	149,110	66.7%	35	185	6,475	479.6
Port Lions-Homer	1,797	240,798	25.1%	695	93,130	55.2%	34	134	4,556	337.5
Port Lions-Kodiak	2,209	106,032	29.2%	922	44,256	71.2%	36	48	1,728	128.0
Seldovia-Homer	2,187	37,179	17.9%	827	14,059	41.2%	58	17	986	73.03
Seward-Kodiak	1,682	311,170	22.8%	842	155,770	69.1%	35	185	6,475	479.6
Total	22,124	2,281,869		8,417	875,005		402		37,998	2,815

Table 13
1997 *Tustumena* Service Summary for
Alaska Peninsula and Aleutians

Alaska Peninsula & Aleutians										
	Passenger			Vehicles			Trips	Link	Vessel	Transit
	Count	Miles	Capacity Ratio	Count	Miles	Capacity Ratio	Trips	Length (n.m.)	Miles	Hours
Akutan-Cold Bay	279	44,092	18.9%	117	18,486	44.7%	7	158	1,106	81.9
Chignik-Kodiak	491	122,259	33.4%	209	52,041	78.3%	7	249	1,743	129.1
Chignik-Sand Point	400	55,200	27.2%	156	21,528	57.3%	7	138	966	71.6
Cold Bay-False Pass	411	23,838	27.9%	74	4,292	27.9%	7	58	406	30.1
Cold Bay-King Cove	321	8,025	21.8%	158	3,950	60.4%	7	25	175	13.0
False Pass-Unalaska	395	40,685	26.8%	76	7,828	28.4%	7	103	721	53.4
King Cove-Cold Bay	488	12,200	33.1%	108	2,700	42.3%	7	25	175	13.0
King Cove-Sand Point	380	37,240	25.8%	174	17,052	66.5%	7	98	686	50.8
Kodiak-Chignik	513	127,737	34.8%	203	50,547	75.7%	7	249	1,743	129.1
Sand Point-Chignik	339	46,782	23.0%	177	24,426	66.4%	7	138	966	71.6
Sand Point-King Cove	541	53,018	36.8%	148	14,504	56.4%	7	98	686	50.8
Unalaska-Akutan	345	15,525	23.4%	117	5,265	44.7%	7	45	315	23.3
Total	4,903	586,591		1,717	222,619		84		9,688	717.6

Table 14
Summary of 1997 *Tustumena* Service by Sub-Region

Summary by Sub-Region							
	Passenger		Vehicles			Vessel	Transit
	Count	Miles	Count	Miles	Trips	Miles	Hours
Prince William Sound	7,827	592,720	2,454	193,234	213	16,423	1,217
Kodiak-Kenai Pen.	22,124	2,281,869	8,417	875,005	402	37,998	2,815
Alaska Pen. & Aleutians	4,903	586,591	1,717	222,619	84	9,688	718
Total	34,854	3,461,180	12,588	1,290,858	699	64,109	4,749

It may be seen that the *Tustumena* vessel miles and transit hours expended in Prince William Sound are more than sufficient to permit a 100 percent increase in service to the Alaska Peninsula and Aleutians without any reduction in service to Kodiak and the

Kenai Peninsula. However, from a vessel revenue perspective it would appear that shifting *Tustumena* service from Prince William Sound to the Alaska Peninsula and Aleutians would entail a reduction in annual passengers and vehicles carried.

Table 15 shows an estimate of the distribution of annual operating hours. Average port time for the various sub-regions is estimated based on a review and analysis of the 1998-1999 schedule for the *Tustumena*.

Table 15
Estimated Distribution of 1997 *Tustumena* Operating Hours
by Sub-Region

Summary by Sub-Region					
	Trips	Vessel	Transit	Avg. Port	Total
		Miles	Hours	Time	Operating Hours
Prince William Sound	213	16,423	1,217	893	2,110
Kodiak-Kenai Pen.	402	37,998	2,815	1,686	4,500
Alaska Pen. & Aleutians	84	9,688	718	352	1,070
Total	699	64,109	4,749	2,931	7,680

The approximately 2,110 hours that the *Tustumena* currently spends annually in Prince William Sound service could provide for a doubling of the current 1,070 hours of Alaska Peninsula and Aleutian Island service and still provide an almost equal number of hours (1,030) for service improvements elsewhere in the Southwest Alaska region (e.g., in particular an increase in the level of service to the southern coastal communities of the Alaska Peninsula and Aleutian Islands out to Unalaska).

OPTION A (TWO TRIPS TO ALEUTIANS PER FOUR WEEK CYCLE)

Guiding Principles for Increased Service

The following are identified for the purposes of this technical memorandum as guiding principles for increased service from the *Tustumena* to the Southwest Alaska region:

- Service to the southern communities of the Alaska Peninsula and the Aleutian Islands out to Unalaska should be increased to two trips per month.
- The annual number of trips linking Kodiak to the Kenai Peninsula should be maintained at or near current levels.
- The annual number of trips linking Port Lions to the Kenai Peninsula should be maintained at or near current levels.
- The annual number of trips linking Port Lions to Kodiak should be maintained at or near current levels.
- Trips linking Kodiak (and/or Port Lions) to Homer may be substituted for trips linking Kodiak (and/or Port Lions) to Seward. Each such substitution has the effect of recovering approximately 3.6 hours of transit time (for a one-way transit) due to the shorter distance between Kodiak and Homer as compared to Kodiak to Seward.

- The *Tustumena* currently links Seldovia with Homer. In 1997 the *Tustumena* made 58 trips to Seldovia (*Tustumena* made 73 arrivals at Homer during 1997 from either Kodiak or Port Lions). As a separate aspect of the Southwest Alaska Transportation Plan, a new ferry linking Homer and Williamsport is proposed. That same ferry could also provide service linking Seldovia and Homer with equal or greater frequency of service and capacity compared to the service currently provided by the *Tustumena*. Accordingly an assumption for the purposes of this technical memorandum is that the *Tustumena* will cease to be the vessel providing ferry service between Seldovia and Homer.
- Similarly, False Pass is currently served only one-way (westbound) by the *Tustumena*. For the purposes of this technical memorandum, it is assumed that the *Tustumena* will call at False Pass both westbound and eastbound.
- Studies are currently underway, and substantial Federal funding has been provided for a surface transportation link between King Cove and Cold Bay. The new link, when completed, will presumably be either an all road link or a combination of some new road and a ferry operating on the waters of Cold Bay (perhaps operating from Lenard Harbor). Once this surface link is in place, it is thought to be unnecessary for the *Tustumena* to call at both King Cove and Cold Bay. Accordingly, for the purposes of this technical memorandum, it is assumed that the *Tustumena* will call only at King Cove.

Service to Kodiak and Port Lions

Historical levels of service connecting Kodiak Island to the Kenai Peninsula are summarized in Table 16.

Table 16
1997 *Tustumena* Service Between Kodiak or Port Lions
and the Kenai Peninsula

Kenai Peninsula & Kodiak Island										
	Passenger			Vehicles				Link	Vessel	Transit
	Count	Miles	Capacity Ratio	Count	Miles	Capacity Ratio	Trips	Length (n.m.)	Miles	Hours
Homer-Kodiak	3,043	413,848	39.1%	932	126,752	70.7%	37	136	5,032	372.7
Homer-Port Lions	2,305	308,870	30.4%	927	124,218	71.4%	36	134	4,824	357.3
Kodiak-Homer	3,101	421,736	37.8%	870	118,320	60.7%	39	136	5,304	392.9
Kodiak-Seward	1,717	317,645	23.3%	806	149,110	66.7%	35	185	6,475	479.6
Port Lions-Homer	1,797	240,798	25.1%	695	93,130	55.2%	34	134	4,556	337.5
Seward-Kodiak	1,682	311,170	22.8%	842	155,770	69.1%	35	185	6,475	479.6
Total	13,645	2,014,067		5,072	767,300		216		32,666	2,420

Historical levels of service connecting Kodiak with the Kenai Peninsula are summarized in Table 17.

Table 17
1997 *Tustumena* Service Between Kodiak
and the Kenai Peninsula

Kenai Peninsula & Kodiak										
	Passenger			Vehicles			Trips	Link	Vessel	Transit
	Count	Miles	Capacity Ratio	Count	Miles	Capacity Ratio		Length (n.m.)	Miles	Hours
Homer-Kodiak	3,043	413,848	39.1%	932	126,752	70.7%	37	136	5,032	372.7
Kodiak-Homer	3,101	421,736	37.8%	870	118,320	60.7%	39	136	5,304	392.9
Kodiak-Seward	1,717	317,645	23.3%	806	149,110	66.7%	35	185	6,475	479.6
Seward-Kodiak	1,682	311,170	22.8%	842	155,770	69.1%	35	185	6,475	479.6
Total	9,543	1,464,399		3,450	549,952		146		23,286	1,725

Historical levels of service connecting Port Lions and the Kenai Peninsula are summarized in Table 18.

Table 18
1997 *Tustumena* Service Between Port Lions
and the Kenai Peninsula

Kenai Peninsula & Port Lions										
	Passenger			Vehicles			Trips	Link	Vessel	Transit
	Count	Miles	Capacity Ratio	Count	Miles	Capacity Ratio		Length (n.m.)	Miles	Hours
Homer-Port Lions	2,305	308,870	30.4%	927	124,218	71.4%	36	134	4,824	357.3
Port Lions-Homer	1,797	240,798	25.1%	695	93,130	55.2%	34	134	4,556	337.5
Total	4,102	549,668		1,622	217,348		70		9,380	695

Historical levels of service between Port Lions and Kodiak are summarized in Table 19.

Table 19
1997 Tustumena Service Between Port Lions and Kodiak

Port Lions & Kodiak										
	Passenger			Vehicles			Trips	Link	Vessel	Transit
	Count	Miles	Capacity Ratio	Count	Miles	Capacity Ratio		Length (n.m.)	Miles	Hours
Kodiak-Port Lions	1,780	85,440	24.9%	718	34,464	56.7%	34	48	1,632	120.9
Port Lions-Kodiak	2,209	106,032	29.2%	922	44,256	71.2%	36	48	1,728	128.0
Total	3,989	191,472		1,640	78,720		70		3,360	249

Service to Seldovia

As described above, it is presumed that service between Seldovia and Homer will be assumed by a new ferry also providing service between Homer and Williamsport. The historical level of service to Seldovia that should be equaled or exceeded is summarized in Table 20.

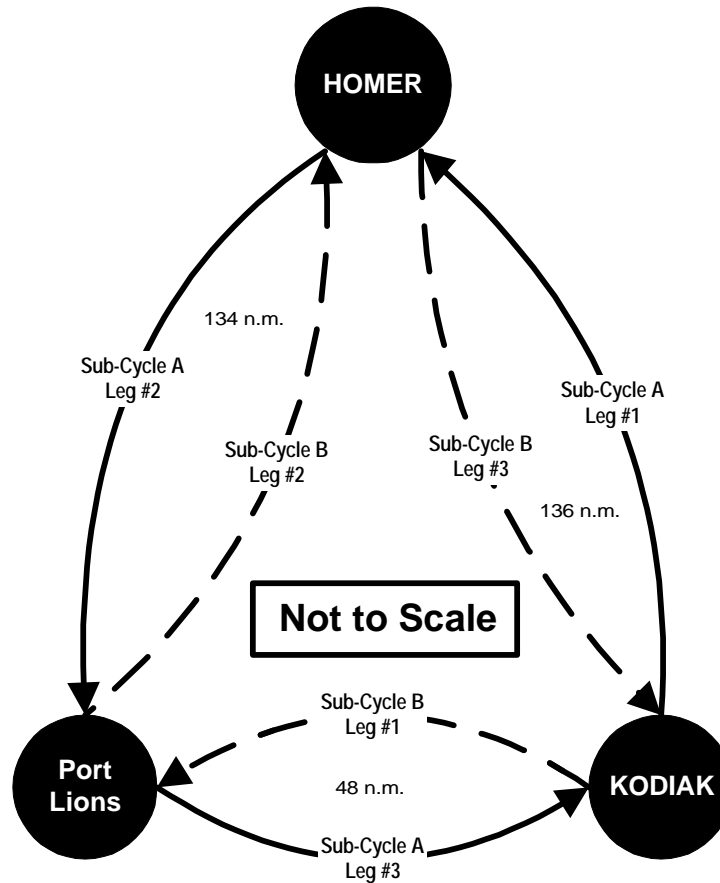
Table 20
1997 Tustumena Service Between Seldovia and Homer

Seldovia and Homer										
	Passenger			Vehicles			Trips	Link	Vessel	Transit
	Count	Miles	Capacity Ratio	Count	Miles	Capacity Ratio		Length (n.m.)	Miles	Hours
Homer-Seldovia	2,303	39,151	18.9%	878	14,926	43.9%	58	17	986	73.0
Seldovia-Homer	2,187	37,179	17.9%	827	14,059	41.2%	58	17	986	73.0
Total	4,490	76,330		1,705	28,985		116		1,972	146

Model Schedule

A model 28-day “Option A” schedule for the *Tustumena* was developed in Microsoft PROJECT (Figure 6).

Figure 6
Kodiak Cycle #1



Kodiak Cycle #1: Requires 60 hours

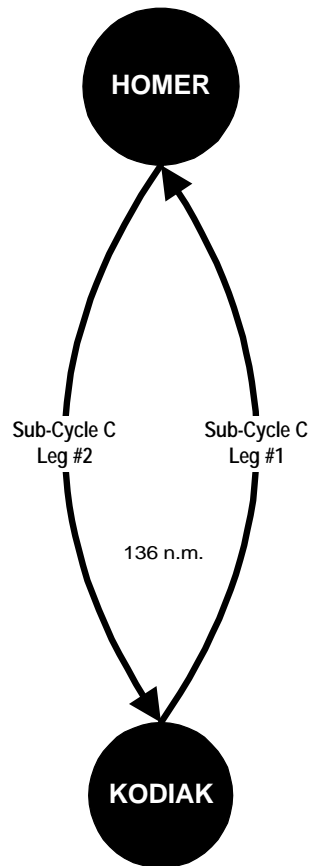
———— Sub-Cycle A: Kodiak - Homer - Port Lions - Kodiak

—— ——— Sub-Cycle B: Kodiak - Port Lions - Homer - Kodiak

Table 21
Kodiak Cycle #1 (Including Port Lions)

		2400 hour clock		Decimal Hours			
	Day #	Arrive	Depart	Transit Duration	Port Time	Link Duration	Cumulative Duration
Kodiak	1		0000 hrs			0.0 hrs	0.0 hrs
Homer	1	0930 hrs	1130 hrs	9.5 hrs	2.0 hrs	11.5 hrs	11.5 hrs
Port Lions	1	2145 hrs	2215 hrs	10.25 hrs	0.5 hrs	10.75 hrs	22.25 hrs
Kodiak	2	0030 hrs	0615 hrs	2.25 hrs	5.75 hrs	8.0 hrs	30.25 hrs
Port Lions	2	0830 hrs	0900 hrs	2.25 hrs	0.5 hrs	2.75 hrs	33.0 hrs
Homer	2	1900 hrs	2100 hrs	10.0 hrs	2.0 hrs	12.0 hrs	45.0 hrs
Kodiak	3	0630 hrs	1200 hrs	9.5 hrs	5.5 hrs	15.0 hrs	60.0 hrs

Figure 7
Kodiak Cycle #2



Not to Scale

Kodiak Cycle #2: Requires 48 hours

Sub-Cycle C: Kodiak - Homer - Kodiak

Table 22
Kodiak Cycle #2 (Excluding Port Lions)

	Day #	2400 hour clock		Decimal Hours			
		Arrive	Depart	Transit Duration	Port Time	Link Duration	Cumulative Duration
Kodiak	1		0000 hrs			0.0 hrs	0.0 hrs
Homer	1	0930 hrs	1130 hrs	9.5 hrs	2.0 hrs	11.5 hrs	11.5 hrs
Kodiak	1	2100 hrs	0000 hrs	9.5 hrs	3.0 hrs	12.5 hrs	24.0 hrs
Homer	2	0930 hrs	1130 hrs	9.5 hrs	2.0 hrs	11.5 hrs	35.5 hrs
Kodiak	2	2100 hrs	0000 hrs	9.5 hrs	3.0 hrs	12.5 hrs	48.0 hrs

Figure 8
Aleutian Cycle

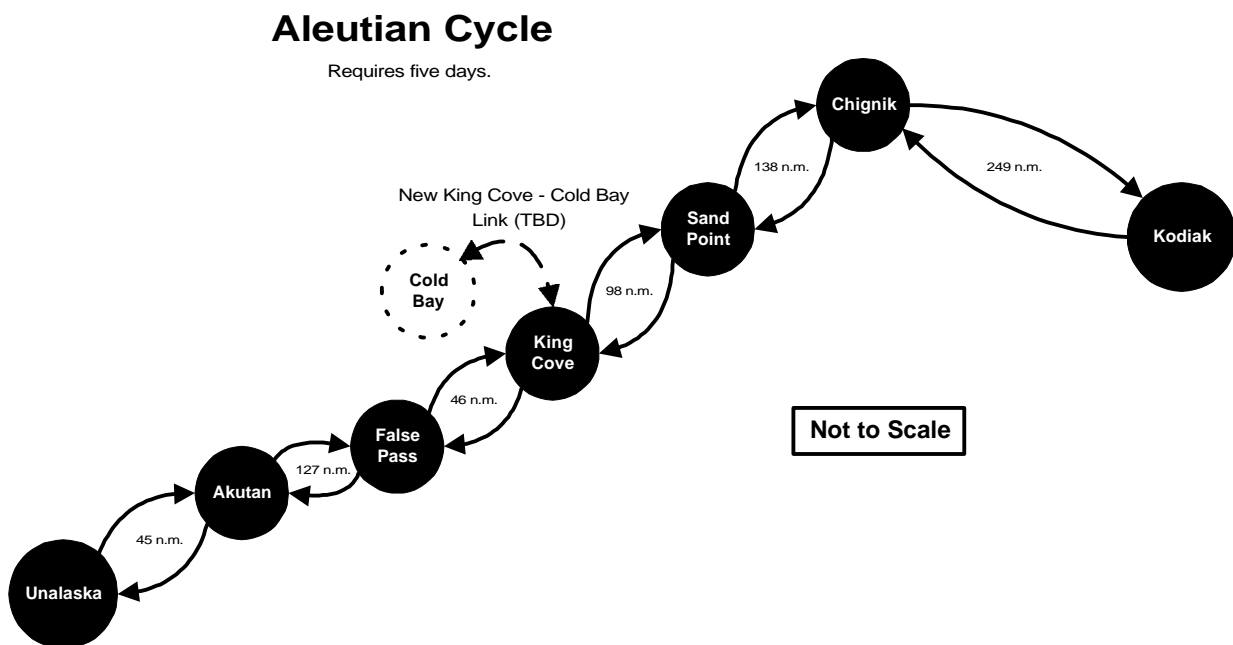


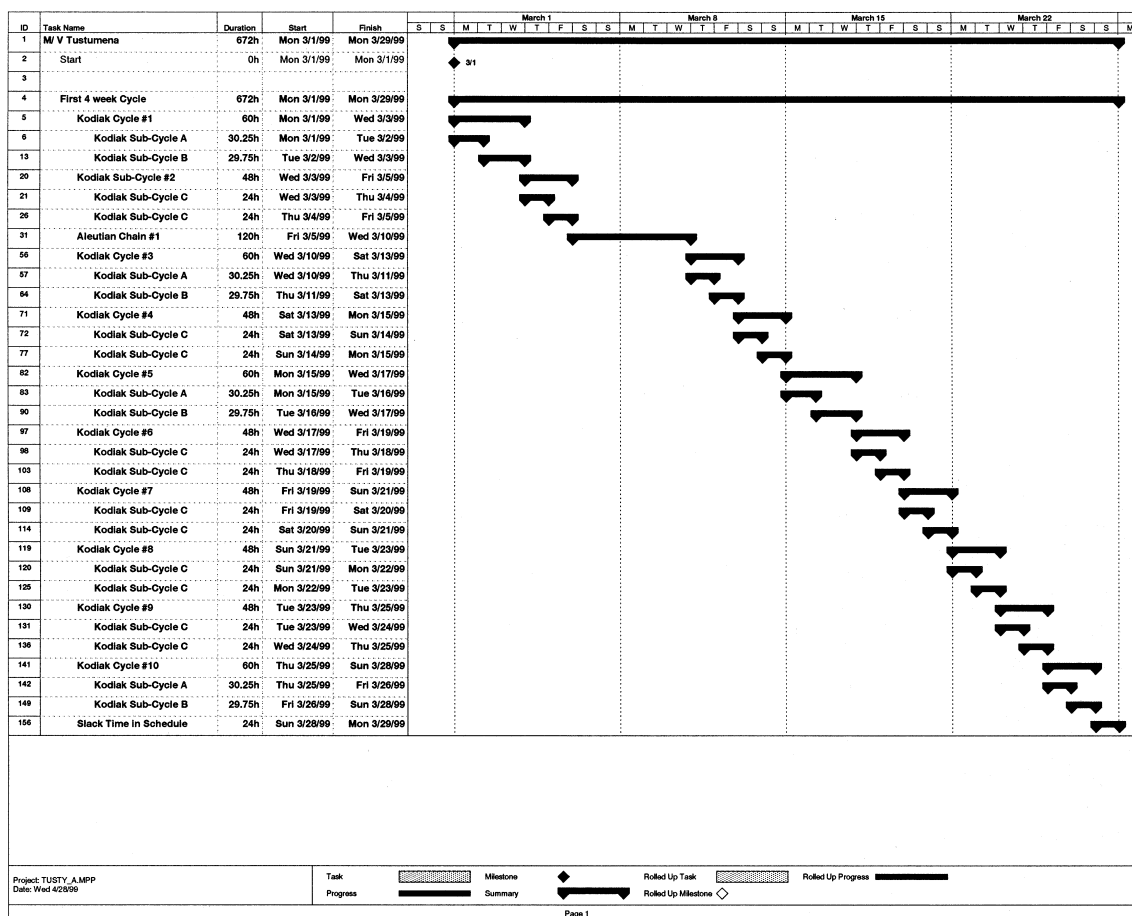
Table 23
Aleutian Cycle, Option A

	Day #	2400 hour clock		Decimal Hours			
		Arrive	Depart	Transit Duration	Port Time	Link Duration	Cumulative Duration
Kodiak	1		0000 hrs			0.0 hrs	0.0 hrs
Chignik	1	1836 hrs	1936 hrs	18.6 hrs	1.0 hrs	19.6 hrs	19.6 hrs
Sand Point	2	0451 hrs	0551 hrs	9.25 hrs	1.0 hrs	10.25 hrs	29.85 hrs
King Cove	2	1221 hrs	1321 hrs	6.5 hrs	1.0 hrs	7.5 hrs	37.35 hrs
False Pass	2	1651 hrs	1751 hrs	3.5 hrs	1.0 hrs	4.5 hrs	41.85 hrs
Akutan	2	0321 hrs	0421 hrs	9.5 hrs	1.0 hrs	10.5 hrs	52.35 hrs
Unalaska	2	0751 hrs	1309 hrs	3.5 hrs	5.3 hrs	8.8 hrs	61.15 hrs
Akutan	2	1639 hrs	1739 hrs	3.5 hrs	1.0 hrs	4.5 hrs	65.65 hrs
False Pass	4	0309 hrs	0409 hrs	9.5 hrs	1.0 hrs	10.5 hrs	76.15 hrs
King Cove	4	0739 hrs	0839 hrs	3.5 hrs	1.0 hrs	4.5 hrs	80.65 hrs
Sand Point	4	1509 hrs	1609 hrs	6.5 hrs	1.0 hrs	7.5 hrs	88.15 hrs
Chignik	5	0124 hrs	0224 hrs	9.25 hrs	1.0 hrs	10.25 hrs	98.4 hrs
Kodiak	5	2100 hrs	0000 hrs	18.6 hrs	3.0 hrs	21.6 hrs	120.0 hrs

Table 24
Summary of Model 28-Day Schedule, Option A

Trip Cycle	Duration	Port Calls			
		Homer to		Aleutians	
		Kodiak	Port Lions	Westbound	Eastbound
Kodiak #1	60 hrs	1	1		
Kodiak #2	48 hrs	2			
Aleutians	120 hrs			1	1
Kodiak #1	60 hrs	1	1		
Kodiak #2	48 hrs	2			
Aleutians	120 hrs			1	1
Kodiak #1	60 hrs	1	1		
Kodiak #2	48 hrs	2			
Kodiak #2	48 hrs	2			
Kodiak #1	60 hrs	1	1		
Total	672 hrs	12	4	2	2

Figure 9
GANTT Chart for 28-Day *Tustumena* Schedule
Option A



The advantage of the 28-day schedule is that it may be repeated, with the day-of-the-week and time of port calls repeating themselves. If this schedule is repeated 11 times during the year, a 44-week service year (typical of AMHS mainline vessels and historical *Tustumena*) is accomplished. In that 44-week service year the *Tustumena* would provide port calls as summarized in Table 25, with the historical number of port calls shown in the table's last row.

Table 25
Summary of 44-Week Service Year
(11 Repetitions of Model 28-Day Schedule)

	Port Calls			
	Kenai Peninsula to		Aleutians	
	Kodiak	Port Lions	Westbound	Eastbound
Dedicated <i>Tustumena</i>	132	44	22	22
Historical (1997) <i>Tustumena</i>	72	36	7	7

Compared to the 1997 historical schedule, this model schedule triples service to the Aleutians and substantially increases service to Kodiak and Port Lions. Not considered here are the two additional 28-day trip cycles that presumably would be accomplished by the *Kennicott* in her secondary role as the stand-in vessel for the *Tustumena* during the *Tustumena*'s annual maintenance period. Those additional 28-day cycles would bring the total number of annual trips to the southern Alaska Peninsula and Aleutians to 26, a 271% increase in annual service to this sub-region.

It must be noted that much of the increase in service to the southern Alaska Peninsula and Aleutians will be provided during the winter months. A period in which this region currently receives no AMHS service. Wind and sea conditions can be severe in this region during the winter months, which may dampen demand for service during this period. On the other hand, AMHS service during this period may be more reliable than air travel, at least to some locations. Furthermore, some of the fisheries that are important to the economy of this sub-region are winter fisheries. Providing AMHS service to this sub-region may provide needed alternatives for the movement of personnel and freight in support of these winter fisheries.

COSTS: OPTION A (TWO TRIPS TO ALEUTIANS PER FOUR WEEK CYCLE)

According to data contained in a "Vessel Cost/Week FY 96-98" Excel spreadsheet provided by AMHS the average (average of 1997 and 1998) annual operating cost for the *Tustumena* is \$7,370,000 (\$165,900 per operating week) based on an average of 44.45 weeks of operation per year.³ Additionally, the *Tustumena* incurred an average of \$339,000 in overhaul/project costs.

In Table 26 the total (total includes both operating costs and overhaul/project costs) current annual operating costs for the *Tustumena* are distributed by vessel miles and also by total operating hours, as set forth in Table 26.

³ Spreadsheet "Vslopccst.xls" with footer date annotation "pd-10/15/98" and "Fy98_vsl.xls" prepared by B. Braley and printed 10/15/98.

Table 26
Distribution of Total Annual Operating Cost
for Current *Tustumena* Operations (44-Week Service Year)

	Prorated by Vessel Miles	Prorated by Operating Hours
Prince William Sound	\$1,975,000	\$2,118,000
Kodiak-Kenai Pen.	\$4,569,000	\$4,517,000
Alaska Pen. & Aleutians	\$1,165,000	\$1,074,000
Total (Annual)	\$7,709,000	\$7,709,000

Current annual cost of *Tustumena* operations serving Prince William Sound are equal to or less than \$2.118 million (Table 26). Depending on the accounting perspective the additional charge to Southwest Region operations if the *Tustumena* were dedicated exclusively to Southwest service would be between \$1.975 million and \$2.118 million.

Capital Improvements

The "Alaska Marine Highway System Vessel Refurbishment and Fleet Replacement Study," prepared by The Glosten Associates, Inc. for Parsons Brinckerhoff, October 1998, identifies the schedule of capital improvements to the *Tustumena* over the next 20 years shown in Table 27.

Table 27
Capital Improvements Schedule for *Tustumena*
(1999 Dollars)

Year	Cost of Scheduled Capital Improvement
2001	\$600,000
2002	\$0
2003	\$4,400,000
2004	\$250,000
2005	\$1,110,000
2006	\$3,684,000
2007	\$300,000
2008	\$0
2009	\$360,000
2010	\$300,000
2011	\$14,400,000
2012	\$8,592,000
2013	\$0
2014	\$2,580,000
2015	\$300,000
2016	\$0
2017	\$0
2018	\$300,000
2019	\$0
2020	\$1,800,000
Total	\$39,016,000

Using a discount rate of $i=7\%$ the present (1999) value of this capital improvement schedule is \$19,107,000, and the uniform equivalent annual capital cost over each of the 20 years is \$1,930,000 per year.

As the exclusive dedication of the *Tustumena* to Southwest service presumably must be preceded by introduction of new vessels into Prince William Sound service, a pro-rated portion of the capital expenditures in the early years of the schedule given in Table 27 should be charged to Prince William Sound. Assuming that the new Prince William Sound vessels do not enter service until 2005, then approximately 25% of the \$5,250,000 capital expenditures between 2001-2004 inclusively, could be charged to Prince William Sound.

Annual Cost by Link

Table 28 presents the annual cost of dedicated *Tustumena* service by link, apportioned to each link according to annual vessel link miles.

Table 28
Dedicated *Tustumena* Service – Annual Cost by Link
Option A

Dedicated Southwest Service				
	Trips	Link	Vessel	Cost
		Length (n.m.)	Miles	
Homer-Kodiak	132	136	17,952	\$1,672,485
Homer-Port Lions	44	134	5,896	\$549,297
Kodiak-Homer	132	136	17,952	\$1,672,485
Kodiak-Port Lions	44	48	2,112	\$196,763
Port Lions-Homer	44	134	5,896	\$549,297
Port Lions-Kodiak	44	48	2,112	\$196,763
Kodiak-Chignik	22	249	5,478	\$510,354
Chignik-Sand Point	22	138	3,036	\$282,847
Sand Point-King Cove	22	98	2,156	\$200,862
King Cove-False Pass	22	46	1,012	\$94,282
False Pass-Akutan	22	127	2,794	\$260,301
Akutan-Unalaska	22	45	990	\$92,233
Unalaska-Akutan	22	45	990	\$92,233
Akutan-False Pass	22	127	2,794	\$260,301
False Pass-King Cove	22	46	1,012	\$94,282
King Cove-Sand Point	22	98	2,156	\$200,862
Sand Point-Chignik	22	138	3,036	\$282,847
Chignik-Kodiak	22	249	5,478	\$510,354
Total (44-Week service year)	704		82,852	\$7,718,848

The distribution of trips, vessel miles and cost for dedicated *Tustumena* service in Southwest Alaska is given in Table 29.

Table 29
Summary of Dedicated *Tustumena* Service
Option A

	Trips	Vessel Miles	Cost
Homer	352	51,920	\$4,837,090
Alaska Pen. & Aleutians	44	30,932	\$2,881,758
Total (Annual)	396	82,852	\$7,718,848

*ESTIMATED DEMAND: OPTION A
(TWO TRIPS TO ALEUTIANS PER FOUR WEEK CYCLE)*

Assuming 1997 historical levels of passenger and vehicle demand per trip on each link results in the projections of traffic volumes and revenue shown in Table 30. Note that service demand for a dedicated *Tustumena* alternative is estimated differently than for the other marine alternatives described herein. This is because dedication of the *Tustumena*, a vessel already in service, to Southwest Alaska ports already served by the AMHS, represents an adaptation of existing service, rather than a wholly new service concept.

As such, it is possible in the case of this alternative to base forecasts of future service, under changed conditions (e.g., demographics, frequency, and seasonality of service) based on actual past demand levels. In contrast, demand for marine service concepts that are wholly new (e.g., Lake Iliamna-Kvichak River) have had to be based on a statistical models that relies on data from other ports and populations to forecast demand using new types of vessels to communities that have no track record with AMHS service.

Table 30
Dedicated *Tustumena* Service, Option A
Estimated Traffic & Revenue by Link

Dedicated Southwest Service								
	Trips	Cost	Passengers			Vehicles		
			Count	Tariff	Revenue	Count	Tariff	Revenue
Homer-Kodiak	132	\$1,672,485	10,857	\$48	\$694,800	,325	\$162	\$538,650
Homer-Port Lions	44	\$549,297	2,818	\$48	\$135,264	1,133	\$162	\$183,546
Kodiak-Homer	132	\$1,672,485	10,496	\$48	\$671,760	2,945	\$162	\$477,090
Kodiak-Port Lions	44	\$196,763	2,304	\$20	\$46,080	930	\$59	\$54,870
Port Lions-Homer	44	\$549,297	2,326	\$48	\$111,648	900	\$162	\$145,800
Port Lions-Kodiak	44	\$196,763	2,700	\$20	\$54,000	1,127	\$59	\$66,493
Kodiak-Chignik	22	\$510,354	1,613	\$76	\$61,332	638	\$272	\$173,536
Chignik-Sand Point	22	\$282,847	1,258	\$42	\$26,418	491	\$142	\$69,722
Sand Point-King Cove	22	\$200,862	1,701	\$32	\$27,232	466	\$102	\$47,532
King Cove-False Pass	22	\$94,282	877	\$34	\$14,926	368	\$111	\$40,848
False Pass-Akutan	22	\$260,301	1,242	\$34	\$21,114			
False Pass-Unalaska	22					368	\$158	\$58,144
Akutan-Unalaska	22	\$92,233	1,085	\$16	\$8,688			
Unalaska-Akutan	22	\$92,233	1,085	\$16	\$8,688			
Unalaska-False Pass	22					368	\$158	\$58,144
Akutan-False Pass	22	\$260,301	877	\$34	\$14,926			
False Pass-King Cove	22	\$94,282	877	\$34	\$14,926	368	\$111	\$40,848
King Cove-Sand Point	22	\$200,862	1,195	\$32	\$19,136	547	\$102	\$55,794
Sand Point-Chignik	22	\$282,847	1,066	\$42	\$22,386	557	\$142	\$79,094
Chignik-Kodiak	22	\$510,354	1,544	\$76	\$58,672	657	\$272	\$178,704
Total (44-Week service year)	704	\$7,718,848	45,921		\$1,968,550	15,188		\$2,268,815

Note: No vehicle service to Akutan

This represents an increase in annual passenger and vehicle demand in the service area on the order of the percentages shown in Table 31.

Table 31
Approximate Increase in Service Demand by Service Area
Associated with Dedicated *Tustumena* Service, Option A

	Passengers	Vehicles
Kodiak-Kenai Pen.	121%	105%
Alaska Pen. & Aleutians	214%	179%

In "Break-Even Demand on Alternative Ferry Systems in Lynn Canal," February 1999, prepared by Northern Economics, Inc. it was estimated that traffic demand would increase in response to more frequent service. Although a similar demand elasticity analysis has not been performed for Southwest Alaska, the same principles are presumably transferable. Certainly the findings of "Break-Even Demand on Alternative Ferry Systems in Lynn Canal" would tend to support the increases in traffic demand indicated in Table 30 and Table 31.

Total annual revenue could be on the order of \$4,237,365, exclusive of on-board sales of staterooms and food. Estimated revenues from stateroom rentals is on the order of \$300,000 and onboard food sales are on the order of \$100,000. Total annual revenue will therefore be on the order of \$4,637,000, which represents approximately 60% of annual operating cost (i.e., implied 40% operating subsidy).

OPTION B

(ONE TRIP TO ALEUTIANS PER FOUR WEEK CYCLE)

Option B's chief distinction from Option A is that Option B would only provide one trip per four week cycle to the Aleutians, rather than two. Table 32 summarizes a model 28-day schedule for Option B.

Guiding Principles for Increased Service

The following are identified for the purposes of this technical memorandum as guiding principles for increased service from the *Tustumena* to the Southwest Alaska region:

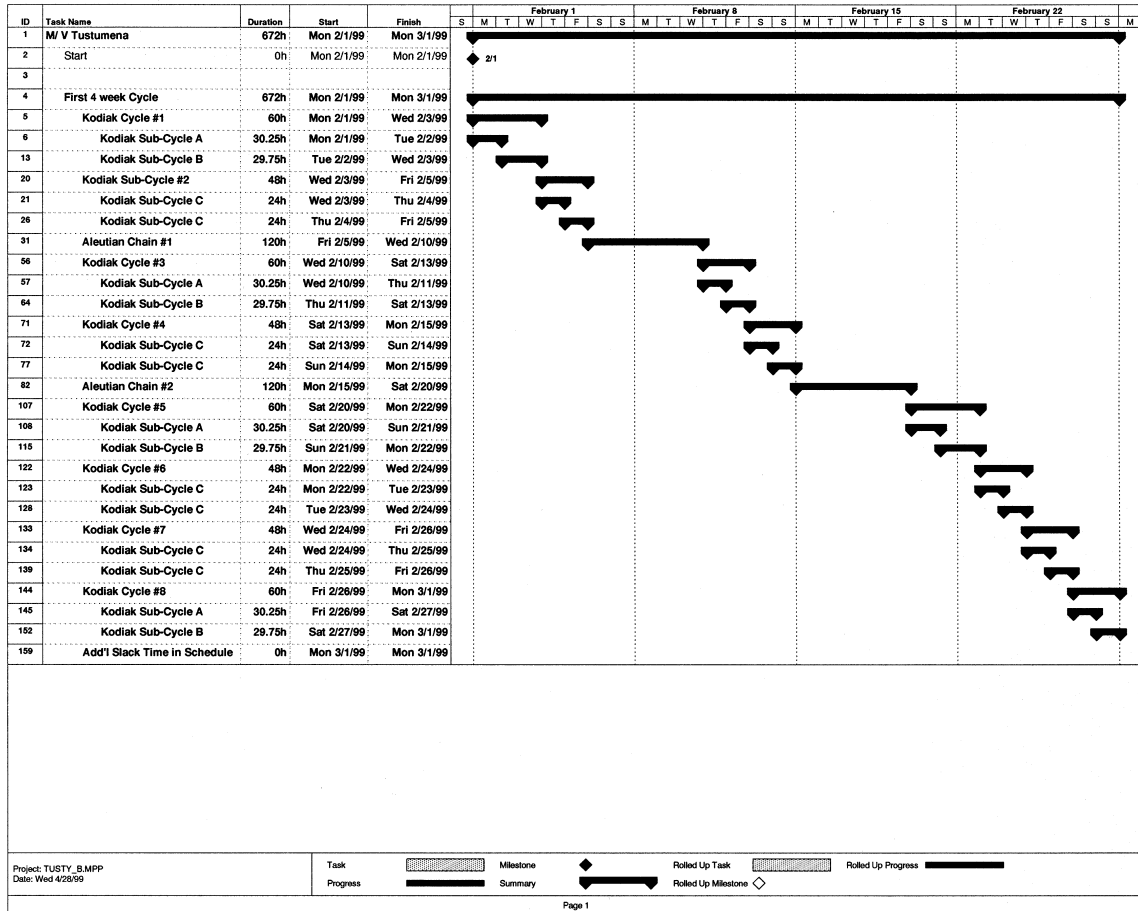
- The annual number of trips linking Kodiak to the Kenai Peninsula should not be reduced.
- The annual number of trips linking Port Lions to the Kenai Peninsula should not be reduced.
- The annual number of trips linking Port Lions to Kodiak should not be reduced.
- Trips linking Kodiak (and/or Port Lions) to Homer may be substituted for trips linking Kodiak (and/or Port Lions) to Seward. Each such substitution has the effect of recovering approximately 3.6 hours of transit time (for a one-way transit) due to the shorter distance between Kodiak and Homer as compared to Kodiak to Seward.

- The *Tustumena* currently links Seldovia with Homer. In 1997 the *Tustumena* made 58 trips to Seldovia (*Tustumena* made 73 arrivals at Homer during 1997 from either Kodiak or Port Lions). As a separate aspect of the Southwest Alaska transportation plan a new ferry linking Homer and Williamsport is proposed. That same ferry could also provide service linking Seldovia and Homer with equal or greater frequency of service and capacity when compared to the service currently provided by the *Tustumena*. Accordingly an assumption for the purposes of this technical memorandum is that the *Tustumena* will cease to be the vessel providing ferry service between Seldovia and Homer.
- Currently Akutan is served only one-way (eastbound) by the *Tustumena*. For the purposes of this technical memorandum it shall be assumed that the *Tustumena* will call at Akutan both westbound and eastbound.
- Currently False Pass is served only one-way (westbound) by the *Tustumena*. For the purposes of this technical memorandum it shall be assumed that the *Tustumena* will call at False Pass both westbound and eastbound.
- Studies are currently underway and substantial Federal funding has been provided for a surface transportation link between King Cove and Cold Bay. The new link, when completed, will presumably be either an all road link or a combination of some new road and a ferry operating on the waters of Cold Bay (perhaps operating from Lenard Harbor). Once this surface link is in place it is thought to be unnecessary for the *Tustumena* to call at both King Cove and Cold Bay. Accordingly for the purposes of this technical memorandum it is assumed that the *Tustumena* will call only at King Cove.

Table 32
Summary of Model 28-Day Schedule, Option B

		Port Calls			
		Homer to		Aleutians	
Trip Cycle	Duration	Kodiak	Port Lions	Westbound	Eastbound
Kodiak #1	60 hrs	1	1		
Kodiak #2	48 hrs	2			
Aleutians	120 hrs			1	1
Kodiak #1	60 hrs	1	1		
Kodiak #2	48 hrs	2			
Kodiak #1	60 hrs	1	1		
Kodiak #2	48 hrs	2			
Kodiak #2	48 hrs	2			
Kodiak #2	48 hrs	2			
Kodiak #2	48 hrs	2			
Kodiak #1	60 hrs	1	1		
Slack Time	24 hrs				
	672 hrs	16	4	1	1

Figure 10
GANTT Chart for 28-Day *Tustumena* Schedule, Option B



The advantage of the 28-day schedule is that it may be repeated and the day-of-the-week and time of port calls will repeat themselves on a 28-day cycle. If this 28-day schedule is repeated eleven times during the year a 44-week service year (typical of AMHS mainline vessels and historical *Tustumena*) will be accomplished. In that 44-Week service year the *Tustumena* would provide port calls as summarized in Table 33. The historical number of port calls is shown in the last row of Table 33 for comparison.

Table 33
Summary of 44-Week Service Year, Option B
(11 Repetitions of Model 28-Day Schedule)

	Port Calls			
	Kenai Peninsula to		Aleutians	
	Kodiak	Port Lions	Westbound	Eastbound
Dedicated <i>Tustumena</i>	176	44	11	11
Historical (1997) <i>Tustumena</i>	72	36	7	7

Compared to the 1997 historical schedule this model schedule more than doubles service to Kodiak, and substantially increases service to Port Lions, and the Aleutians. Not considered here are the two additional 28-Day trip cycles that presumably would be accomplished by the *Kennicott* in her secondary role as the stand-in vessel for the *Tustumena* during the *Tustumena*'s annual maintenance period. Those additional 28-Day cycles would bring the total number of annual trips to the southern Alaska Peninsula and Aleutians to 13, an 85% increase in annual service to this sub-region.

It must be noted that much of the increase in service to the southern Alaska Peninsula and Aleutians will be provided during the winter, during which this region currently receives no AMHS service. Wind and sea conditions can be severe in this region during the winter, which may dampen service demand at this time. On the other hand, AMHS service during this period may be more reliable than air travel, at least to some locations. Furthermore, some of the fisheries that are important to the economy of this sub-region are winter fisheries. Providing AMHS service to this sub-region may provide needed alternatives for the movement of personnel and freight in support of these winter fisheries.

COSTS: OPTION B (ONE TRIP TO ALEUTIANS PER FOUR WEEK CYCLE)

According to data contained in a "Vessel Cost/Week FY 96-98" Excel spreadsheet⁴ provided by AMHS the average (average of 1997 and 1998) annual operating cost for the *Tustumena* is \$7,370,000 (\$165,900 per operating week) based on an average of 44.45 weeks of operation per year. Additionally, the *Tustumena* incurred an average of \$339,000 in overhaul/project costs.

In Table 34, the total (total includes both operating costs and overhaul/project costs) current annual operating costs for the *Tustumena* are distributed by vessel miles and also by total operating hours:

⁴ Spreadsheet "Vslopcst.xls" with footer date annotation "pd-10/15/98" and "Fy98_vsl.xls" prepared by B. Braley and printed 10/15/98.

Table 34
Distribution of Total Annual Operating Cost
for Current *Tustumena* Operations (44-Week Service Year)

	Prorated by Vessel Miles	Prorated by Operating Hours
Prince William Sound	\$1,975,000	\$2,118,000
Kodiak-Kenai Pen.	\$4,569,000	\$4,517,000
Alaska Pen. & Aleutians	\$1,165,000	\$1,074,000
TOTAL (Annual)	\$7,709,000	\$7,709,000

Current annual costs associated with operating the *Tustumena* in Prince William Sound are equal to or less than \$2.118 million as shown in Table 34. Depending on the accounting perspective, the additional charge to Southwest Region operations if the *Tustumena* were dedicated exclusively to Southwest service would be between \$1.975 million and \$2.118 million.

Capital Improvements

The "Alaska Marine Highway System Vessel Refurbishment and Fleet Replacement Study," prepared by The Glosten Associates, Inc. for Parsons Brinckerhoff (October 1998), identifies the following schedule of capital improvements to the *Tustumena* over the next 20 years. These improvements and their projected costs are summarized in Table 35.

Table 35
Capital Improvements Schedule for *Tustumena*
(1999 Dollars)

YEAR	Cost of Scheduled Capital Improvement
2001	\$600,000
2002	\$0
2003	\$4,400,000
2004	\$250,000
2005	\$1,110,000
2006	\$3,684,000
2007	\$300,000
2008	\$0
2009	\$360,000
2010	\$300,000
2011	\$14,400,000
2012	\$8,592,000
2013	\$0
2014	\$2,580,000
2015	\$300,000
2016	\$0
2017	\$0
2018	\$300,000
2019	\$0
2020	\$1,800,000
TOTAL	\$39,016,000

Using a discount rate of $i=7\%$ the present (1999) value of this capital improvement schedule is \$19,107,000 and the uniform equivalent annual capital cost over each of the 20-Years is \$1,930,000 per year.

As the exclusive dedication of the *Tustumena* to Southwest service presumably must be preceded by introduction of new vessels into Prince William Sound service, a pro-rated portion of the capital expenditures in the early years of the schedule given in Table 35 should be charged to Prince William Sound. Assuming that the new Prince William Sound vessels do not enter service until 2005, then approximately 25% of the \$5,250,000 capital expenditures between 2001-2004 inclusively, could be charged to Prince William Sound.

Annual Cost by Link

Table 36 presents the annual cost of dedicated *Tustumena* service by link, apportioned to each link according to annual vessel link miles.

Table 36
Dedicated *Tustumena* Service – Annual Cost by Link
Option B

Dedicated Southwest Service				
	Trips	Link	Vessel Miles	Cost
		Length (n.m.)		
Homer-Kodiak	176	136	23,936	\$2,327,726
Homer-Port Lions	44	134	5,896	\$573,374
Kodiak-Homer	176	136	23,936	\$2,327,726
Kodiak-Port Lions	44	48	2,112	\$205,388
Port Lions-Homer	44	134	5,896	\$573,374
Port Lions-Kodiak	44	48	2,112	\$205,388
Kodiak-Chignik	11	249	2,739	\$266,362
Chignik-Sand Point	11	138	1,518	\$147,622
Sand Point-King Cove	11	98	1,078	\$104,833
King Cove-False Pass	11	46	506	\$49,207
False Pass-Akutan	11	127	1,397	\$135,855
Akutan-Unalaska	11	45	495	\$48,138
Unalaska-Akutan	11	45	495	\$48,138
Akutan-False Pass	11	127	1,397	\$135,855
False Pass-King Cove	11	46	506	\$49,207
False Pass-King Cove	11	98	1,078	\$104,833
King Cove-Sand Point	11	138	1,518	\$147,622
Chignik-Kodiak	11	249	2,739	\$266,362
Total (44-Week service year)	660		79,354	\$7,717,010

The distribution of trips, vessel miles and cost for dedicated *Tustumena* service in Southwest Alaska is given in Table 37.

Table 37
Summary of Dedicated *Tustumena* Service, Option B

	Trips	Vessel Miles	Cost
Homer	440	63,888	\$6,212,974
Alaska Pen. & Aleutians	22	15,466	\$1,504,036
TOTAL (Annual)	462	79,354	\$7,717,010

*ESTIMATED DEMAND: OPTION B
(ONE TRIP TO ALEUTIANS PER FOUR WEEK CYCLE)*

Assuming 1997 historical levels of passenger and vehicle demand per trip on each link results in the projections of traffic volumes and revenue shown in Table 38.

Table 38
Dedicated *Tustumena* Service
Estimated Traffic & Revenue by Link, Option B

Dedicated Southwest Service								
	Trips	Costs	Passengers			Vehicles		
			Count	Tariff	Revenue	Count	Tariff	Revenue
Homer-Kodiak	176	\$2,327,726	14,475	\$48	\$694,800	4434	\$162	\$718,308
Homer-Port Lions	44	\$573,374	2,818	\$48	\$135,264	1133	\$162	\$183,546
Kodiak-Homer	176	\$2,327,726	13,995	\$48	\$671,760	3,927	\$162	\$636,174
Kodiak-Port Lions	44	\$205,388	2,304	\$20	\$46,080	930	\$59	\$54,870
Port Lions-Homer	44	\$573,374	2,326	\$48	\$111,648	900	\$162	\$145,800
Port Lions-Kodiak	44	\$205,388	2,700	\$20	\$54,000	1,127	\$59	\$66,493
Kodiak-Chignik	11	\$266,362	807	\$76	\$61,332	319	\$272	\$86,768
Chignik-Sand Point	11	\$147,622	629	\$42	\$26,418	246	\$142	\$34,932
Sand Point-King Cove	11	\$104,833	851	\$32	\$27,232	233	\$102	\$23,766
King Cove-False Pass	11	\$49,207	439	\$34	\$14,926	184	\$111	\$20,424
False Pass-Akutan	11	\$135,855	621	\$34	\$21,114			
False Pass-Unalaska	11					184	\$158	\$29,072
Akutan-Unalaska	11	\$48,138	543	\$16	\$8,688			
Unalaska-Akutan	11	\$48,138	543	\$16	\$8,688			
Unalaska-False Pass	11					184	\$158	\$29,072
Akutan-False Pass	11	\$135,855	439	\$34	\$14,926			
False Pass-King Cove	11	\$49,207	439	\$34	\$14,926	184	\$111	\$20,424
King Cove-Sand Point	11	\$104,833	598	\$32	\$19,136	274	\$102	\$27,948
Sand Point-Chignik	11	\$147,622	533	\$42	\$22,386	279	\$142	\$39,618
Chignik-Kodiak	11	\$266,362	772	\$76	\$58,672	329	\$272	\$89,488
Total (44-Week service year)	660	\$7,717,010	45,832		\$2,011,996	14,867		\$2,206,703

Note: No vehicle service to Akutan

This represents an increase in annual passenger and vehicle demand in the service area on the order of the percentages shown in Table 39.

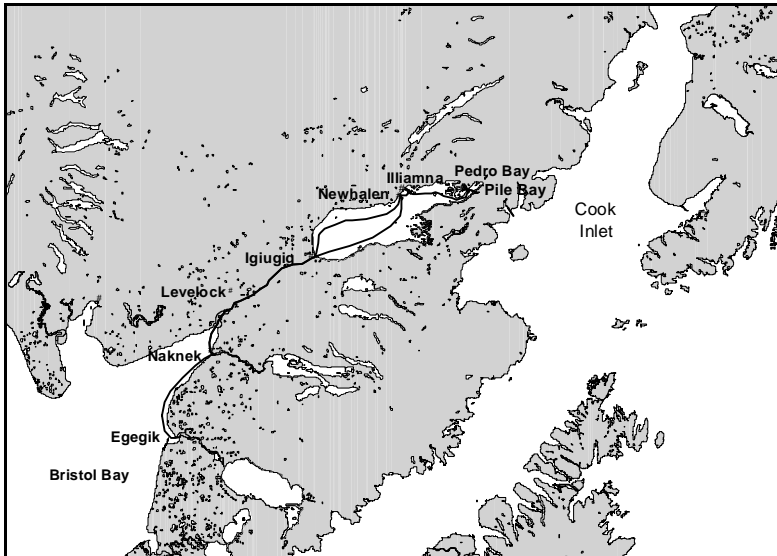
Table 39
Approximate Increase in Service Demand by Service Area
Associated with Dedicated *Tustumena* Service, Option B

	Passengers	Vehicles
Kodiak-Kenai Pen.	171%	146%
Alaska Pen. & Aleutians	57%	40%

In "Break-Even Demand on Alternative Ferry Systems in Lynn Canal," February 1999, prepared by Northern Economics, Inc., it was determined that traffic demand will increase in response to more frequent service. Although a similar demand elasticity analysis has not been performed for Southwest Alaska, the principles are presumably transferable. Certainly the findings of "Break-Even Demand on Alternative Ferry Systems in Lynn Canal" would tend to support the increases in traffic demand indicated in Table 38 and Table 39.

Total annual revenue could be on the order of \$4,218,699 exclusive of on-board sales of staterooms and food. Estimated revenues from stateroom rentals is on the order of \$300,000 and onboard food sales are on the order of \$100,000. Total annual revenue would therefore be on the order of \$4,619,000, which represents approximately 60% of annual operating costs (i.e., implying a 40% operating subsidy).

KVICHAK RIVER-LAKE ILIAMNA MARINE LINK



Making Regional Connections

Improvement and development of surface transportation in the Kvichak River and Iliamna Lake corridor has been identified as a goal for Southwest Alaska regional transportation. Improvement of surface transportation in this corridor will provide a more direct surface connection between Cook Inlet and Bristol Bay, and it will promote rural Alaska tourism.

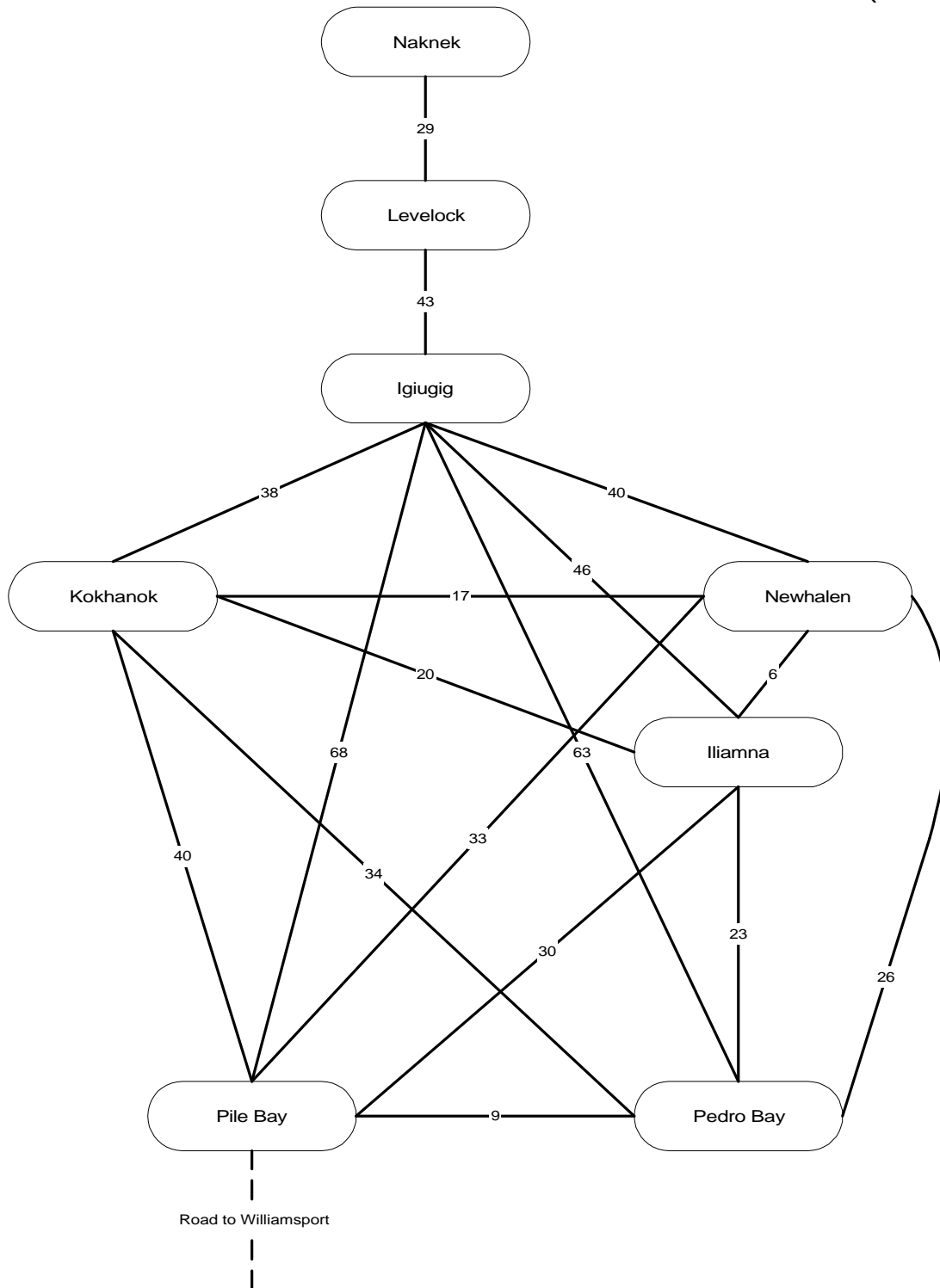
The Cook Inlet point of entry to the Kvichak River-Iliamna Lake corridor is at Williamsport. The Williamsport to Pile Bay road connects Williamsport on Cook Inlet to Pile Bay on Iliamna Lake. Iliamna Lake is navigable by conventional marine craft during the ice free season which extends from May 1 through October 31.

Iliamna Lake provides the headwaters to the Kvichak River which flows into Bristol Bay at Naknek. While the lower reaches of the Kvichak River are navigable during the ice free season the upper reaches of the river are subject to seasonal low water that could impact the navigability for some conventional vessels.

Two marine alternatives have been considered for Kvichak River-Iliamna Lake service. One is a high-speed, shallow-draft, aluminum landing craft with the capacity for two loaded full-sized pickup trucks, and the other is a hovercraft. The hovercraft offers the possibility of extended season service as hovercraft could operate over shoal waters in the Kvichak River and over ice. However, hovercraft operations would probably have to be temporarily suspended during spring breakup and possibly during freezeup.

Figure 11 shows the distances between the communities to be served in the Kvichak River-Iliamna Lake corridor.

Figure 11
Distances in Kvichak River-Iliamna Lake Corridor (n.m.)



Existing Conditions

Table 40 summarizes the available wind data and provides hindcast significant wave height⁵, H_s , for the mean wind conditions. The average wave conditions may be seen to have significant wave heights of two feet or less.

Table 40
Wind and Wave Conditions on Large Lake
During Ice Free Season

	May	June	July	Aug.	Sept.	Oct.
Mean Wind Speed (knots)	9.4	9.2	8.2	8.9	9.2	9.1
Hindcast Mean H_s (feet)	2.00	1.94	1.65	1.85	1.94	1.91
Percent Exceedance of 21 knots	3.8%	3.4%	1.1%	2.8%	3.2%	3.5%

Also shown is the percent of observations where the wind exceeds 21 knots. The hindcast wave condition associated with 21 knot winds has a significant wave height of 6.14 feet and a peak (aka modal) period of about 5.6 seconds. This corresponds to Sea State 4. These waves would be quite steep.

The Project

HIGH-SPEED, SHALLOW-DRAFT, LANDING CRAFT OPTION

The proposed marine transportation alternative for the Kvichak River and Iliamna Lake is a shallow-draft, high-speed, passenger-carrying landing craft. The navigation season is restricted to 1 May through October 31 due to winter ice. The river is seasonally of extremely restricted water depth.

The speed requirements are borne of the following requirements:

- That the vessel operate with a single crew for no more than 12 hours per day (day boat service); hence the vessel must be capable of reliably reaching a suitable port community by the end of a 12-hour run. We are currently planning that the vessel be able to make the upriver transit from Naknek to Newhalen (72 n.m. on the river plus 40 n.m. on the lake, for a 112 n.m. total) in under 12 hours, with half-hour port calls at Levelock and Igiugig enroute.
- Obviously the vessel has to have speed capability comfortably in excess of the peak river current to be encountered anywhere enroute along the river. And the vessel speed must also exceed the average river currents by a sufficient margin to make the transit in under 12 hours, as described under the preceding point. We do not have a detailed current profile of the river at this time.

For planning purposes, we currently believe that a 15-knot vessel could provide round trip service from the western terminus on a three-day turnaround basis (with two 12-hour layovers enroute). A 25-knot vessel could provide this same round trip service on a two-day turnaround basis (with only one 12-hour layover enroute).

⁵ Significant wave height is the average of the highest one-third of all waves in the seaway. The extreme wave heights (occurring approximately once in every 3000 waves) are about twice the significant wave height.

Combine Kvichak River and Iliamna Lake services. Use Naknek as the “home” port (southern terminus). Operate as a dayboat with one crew, thereby restricting operation to no more than 12 hours in any 24-hour period.

Table 41 shows a model high-speed, shallow-draft, landing craft schedule for a typical voyage originating in Naknek and returning to Naknek at the end of the second day. One 12-hour (minimum) layover is required on Iliamna Lake for crew rest.

Table 41
Model Schedule
High-Speed (25 knot), Shallow-Draft Landing Craft

	Arrival		Departure		Port Time	Sailing Time
	Day	Time	Day	Time	Duration	Duration
Naknek			Monday	6:00		1:16
Levelock	Monday	7:16	Monday	7:46	0:30	4:56
Igiugig	Monday	12:42	Monday	13:12	0:30	1:36
Newhalen	Monday	14:48	Monday	15:18	0:30	0:14
Iliamna	Monday	15:32	Monday	16:02	0:30	0:55
Pedro Bay	Monday	16:57	Monday	17:27	0:30	0:22
Pile Bay	Monday	17:49	Tuesday	5:49	12:00	1:36
Kokhanok	Tuesday	7:25	Tuesday	7:55	0:30	0:41
Newhalen	Tuesday	8:36	Tuesday	9:06	0:30	0:41
Kokhanok	Tuesday	9:47	Tuesday	10:17	0:30	0:41
Newhalen	Tuesday	10:58	Tuesday	11:28	0:30	1:36
Igiugig	Tuesday	13:04	Tuesday	13:34	0:30	1:59
Levelock	Tuesday	15:33	Tuesday	16:03	0:30	1:04
Naknek	Tuesday	17:07				

Table 42
High-Speed, Shallow-Draft Landing Craft Service

Prominent characteristics of service	Wild river and large lake. Seasonally extreme shallow water on upper reaches of Kvichak River. Currents on Kvichak River.
Longest run	68 n.m. between Igiugig and Pile Bay. Longest daily run in modeled schedule is twelve (12) hours.
Frequency of service	Basic service is three times per week. Some ports could receive additional calls within this schedule framework (see model schedule). Each voyage commences from Naknek and takes two days. Each voyage requires one twelve (12) hour layover at an Iliamna Lake port in order to comply with U.S. Coast Guard crew work rules.
Seasonality	The ice free navigation season extends from 1 May through 31 October
Probable vessel type	Shallow-draft, high-speed, landing craft
Principal dimensions	LOA \approx 50 feet Beam \approx 16 feet Draft \leq 24 inches loaded Running Draft \approx 14 inches
Service speed	25 knots
Crewing	Two (2), each with U.S. Coast Guard boat operators license.

Where vehicle/cargo units are maximum loaded full size American pickup equivalents, (length 226", width 78", height 74" and GVW of 6500 pounds, each).

It is recommended that the vessel be certified for a maximum passenger capacity of six (6), as that represents a break in the U.S. Coast Guard regulations for crew licensing.

Costs

HIGH-SPEED, SHALLOW-DRAFT, LANDING CRAFT OPTION

Table 43
Vehicle Acquisition and Operating Costs

Vessel Acquisition Cost	\$481,000 F.O.B. Seattle \$45,000 Delivery by barge	
Subtotal: (Acquisition Cost)	\$526,000	
	Minimum	Maximum
Hull Maintenance	\$1,500	\$2,000
Machinery Maintenance	\$4,000	\$5,500
Crew	\$144,000	\$223,000
Fuel	\$90,000	\$110,000
Lubricating Oil	\$1,200	\$1,400
Berthing	\$3,000	\$4,000
Insurance	\$22,000	\$25,000
Subtotal: (Annual Operating Cost)	\$265,700	\$370,900
20 Year Life Cycle Cost (i=3%)		
Present Value	\$4,593,000	\$6,205,000
Uniform Equivalent Annual Cost	\$299,699	\$404,926

Table 44
Shoreside Improvements Infrastructure

Landing area upgrades (road extensions, gravel or concrete pads, etc.) at eight (8) communities (Allowance: 8x\$25,000)	\$200,000	
Aids to navigation on Kvichak River	\$50,000	
Subtotal: (Acquisition Cost)	\$250,000	
	Minimum	Maximum
Annual Maintenance	\$5,500	\$7,000
Subtotal: (Annual Operating Cost)	\$5,500	\$7,000
20 Year Life Cycle Cost (i=3%)		
Present Value	\$334,000	\$357,000
Uniform Equivalent Annual Cost	\$21,800	\$23,300

Estimated Demand

Demand for this service is estimated at 3,600 person trips and 780 vehicles per year.

The Project

HOVERCRAFT OPTION

Two models of hovercraft that have had extensive operating experience in Alaska were investigated. The turbine powered LACV-30 type and the conventionally powered AP.1-88. Of these two vessels, the AP.1-88 was deemed more suitable for the Kvichak River–Iliamna Lake service due to its smaller size, lower operating costs associated with diesel versus turbine propulsion, and lower noise levels.

Other hovercraft are commercially available. However, most of these are much smaller and will not meet the projected freight/passenger load requirements. Also, two existing AP.1-88 vessels, although built in Canada, have unrestricted Jones Act waivers allowing their use in the United States.

The advantages of using the AP.1-88 hovercraft for the Kvichak River–Iliamna Lake service is summarized as follows:

Manning: Low manning is required. Possibly a two-man crew. The vessel currently in use in Alaska operates with a crew of three. This is primarily because there is no interior access between the wheelhouse and the aft passenger compartment. One crew member is required for the aft compartment.

The master must have a hovercraft endorsement from U.S. Coast Guard. This can be attained with 36 hours of classroom study and 36 hours of operating time. The mate need not be fully qualified but must have a radar rating.

Limited Shore Facility Required: The AP.1-88 is able to utilize an un-improved or minimally improved loading/unloading facility.

Operability Envelope: This vessel is able to operate at speeds over 40 knots in sea conditions up to 3- to 4-foot waves, and can operate on land, ice cover, beaches and shallow water. Based on the wind and wave climatology given in Table 40 it is anticipated that the AP.1-88 would have essentially 100% weather operability. However, it would probably be necessary to curtail the hovercraft operations during spring breakup and possibly during freezeup due to unstable ice conditions.

Flexible: The version of the AP.1-88 currently operating in Alaska is configured for 24 passengers with adjustable interior bulkhead to accommodate freight. The aft superstructure doors are wide enough to pass a full size pallet (as used by U.S. Postal Service).

Some potential disadvantages of using hovercraft for this service are as follows:

Noise: The AP.1-88 is relatively noisy compared to the conventional hull option. However, due to diesel propulsion, it is quieter than the turbine powered LACV-30. The current operation in Bethel, Alaska, for the U.S. Postal Service provides opportunity to measure any impacts first-hand.

Limited Payload: The cargo deadweight capacity is small, about 8 short tons (16,000 pounds). However, this is believed to be sufficient to satisfy projected requirements.

Maintenance: Typical maintenance costs associated with hovercraft are not well established but are presumed higher than conventional craft. A higher level of mechanical sophistication, along with having to repair the rubber skirt due to wear, would seem to contribute to higher costs. Also, careful attention to prevention of salt water damage to the air screws and other machinery requires fresh water washdown when operating over brackish water near Naknek. However, most of the proposed service is over fresh water so this is not a great concern or burden to the operation.

The AP.1-88 is a commercial design (versus military) currently operating in Alaska and having the following characteristics (see Figure 12):

- Length, overall 70'-0"
- Beam 33'-0"
- Deadweight 8 T
- Speed, cruising 50 knots
- Passenger capacity 24 to 150
- Crew 3 people
- Installed propulsion power 1,780 BHP

The AP.1-88 would require the following modifications for service as a ferry:

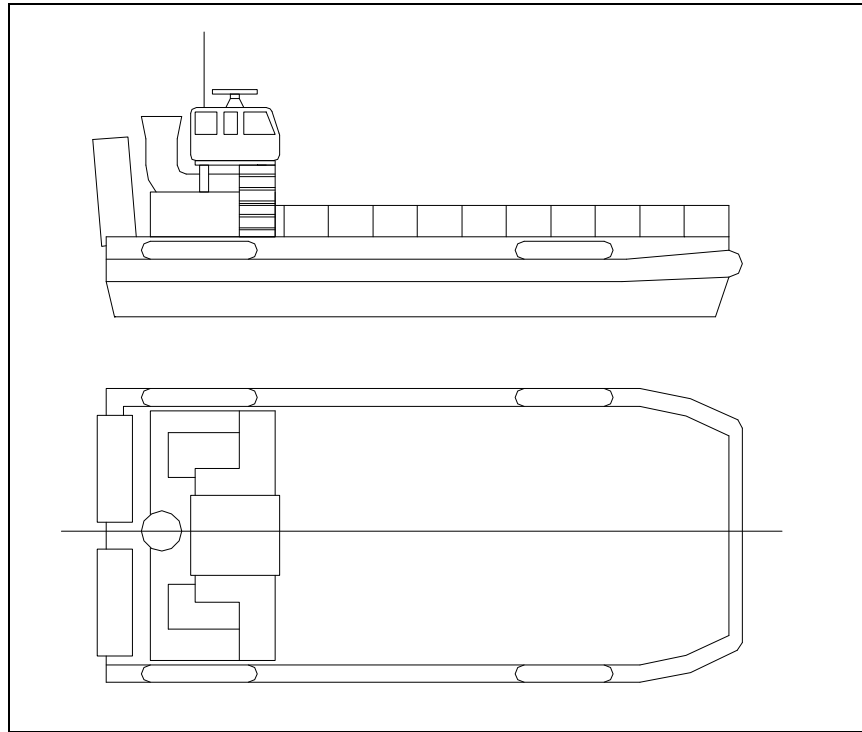
- Reconfiguration of current passenger-only design to handle a mix of passengers, freight and vehicles.
- Installation of a RoRo ramp.
- Additional, or expandable, passenger capacity to 150. This may be accomplished by using containerized passenger vans, installed as portable units, or aircraft type seating packages as needed during peak demand periods.

The AP.1-88 hovercraft has capacity potential as set forth in Table 45:

Table 45
AP.1-88 Capacity Potential

Passenger capacity	24 (nominal) up to 150 (with re-configuration)
Freight payload capacity	8 short tons (16,000 pounds)
Passenger vehicles	Four passenger cars or two full-size loaded pickups; requires some configuration and structural changes.
Trucks/Busses	Not currently configured for heavy trucks or busses; requires configuration and structural changes.

Figure 12
P.1-88 Hovercraft



SUITABILITY TO KVICHAK RIVER-ILIAMNA LAKE OPERATION

Conceptually, loading and unloading can be easily and safely accomplished without extensive investment in shore facilities, provided a suitably sloped beach area with road access is available at the communities to be served. The AP.1-88 is currently operating in passenger and mail service in Bethel, Alaska.

Hovercraft operate without draft restrictions. This would allow considerable flexibility in placing the terminal facilities.

The vessel will be capable of operating in the winter ice conditions that of the Iliamna Lake and probably over the winter ice on the Kvichak River as well.

Stability criteria applicable to this type of craft can be met so that a Certificate of Inspection can be issued by the U. S. Coast Guard.

The AP.1-88 currently operating in Bethel meets the IMO Code of Safety for Dynamically Supported Craft and is classified by Det Norske Veritas, the Norwegian ship classification society. It currently holds all necessary certificates from the U.S. Coast Guard for service similar to that required for the Kvichak River and Iliamna Lake.

MODEL SCHEDULE

The AP.1-88 hovercraft operates at sufficiently high speed that the highly desirable result of twelve-hour service day dayboat operation can be achieved. Table shows a possible model schedule based on 40 knot operating speed on the lower Kvichak River, 30 knot operating speed on the upper Kvichak River and 50 knot operating speed on Iliamna Lake. In order to maintain the twelve-hour service day port calls are limited to twenty minutes. This model schedule accomplishes the daily round trip in eleven hours, allowing one-half hour in the morning for startup and one-half hour in the evening for shutdown. It is presumed that the hovercraft would be home ported at and the operating crew would be based at Naknek.

For the purpose of operating cost analysis it is presumed that the hovercraft operates five days a week except during breakup and freezeup. Twenty days each are allowed for breakup and freezeup, and those forty days are allocated to annual maintenance.

Table 46
Model Schedule
(40 kt lower river; 30 kt upper river; 50 kt lake)

	Arrival		Departure		Port Time	Sailing Time
	Day	Time	Day	Time	Duration	Duration
Naknek			Same Day	6:30		0:45
Levelock	Same Day	7:15	Same Day	7:35	0:20	1:30
Igiugig	Same Day	9:05	Same Day	9:25	0:20	0:50
Newhalen	Same Day	10:15	Same Day	10:35	0:20	0:10
Iliamna	Same Day	10:45	Same Day	11:05	0:20	0:30
Pedro Bay	Same Day	11:35	Same Day	11:55	0:20	0:15
Pile Bay	Same Day	12:10	Same Day	12:30	0:20	0:50
Kokhanok	Same Day	13:20	Same Day	13:40	0:20	0:50
Igiugig	Same Day	14:30	Same Day	14:50	0:20	1:30
Levelock	Same Day	16:20	Same Day	16:40	0:20	0:45
Naknek	Same Day	17:25				

Costs

HOVERCRAFT

Long-Term Operational Cost

Capital Cost: The construction/acquisition cost of the AP.1-88 is estimated in the range of \$5 to \$6 million. The cost range is influenced by classification and regulatory requirements, extent of outfitting, delivery voyage costs and acquisition scheme.

Maintenance Cost: Hull and machinery maintenance is estimated to be \$800/operating hour. Routine maintenance and repairs are presumed to take place in Naknek overnight and on the two non-operational days in each week. Annual maintenance is presumed to occur during the non-operational periods associated with spring breakup and winter freezeup. The hovercraft operates 220 days per year accumulating 8 hours of transit time per day, for a total of 1760 hours. Therefore:

Estimated maintenance cost = 1760 hours per year x \$800/hr = \$1,408,000

Crew Costs: A crew of two to three would be required to operate the vessel. Costs are based on a three person (single watch) crew as shown in the following table.

Table 47
AP.1-88 Hovercraft Crew Costs (including Benefits)

Crew Costs (220 Operating Days per Year)		
Position	Number	\$ Annual
Master	1	\$109,500
Mate/engineer	1	\$ 89,425
AB	1	\$ 38,325
Total, per year	3	\$237,250

Fuel/Oil Costs: Based on the 1,780 BHP diesel propulsion power plant of the AP.1-88 hovercraft and the 1760 annual transit hours the annual fuel and lube oil consumption are estimated as follows:

Fuel usage = 8.3 gph x 1760 hrs = 14,608 gallons

Lube oil usage = 0.185 gph x 1760 hrs = 326 gallons

Based on current diesel fuel and lubricating oil costs, annual expenditures are as follows:

Fuel oil @ \$1.00/gal x 14,608 gal = **\$14,608**

Lube oil @ \$7.00/gal x 326 gal = **\$2,282**

Summary of Annual Operating Costs:

Table 48
AP.1-88 Hovercraft

Annual Operating Costs	
Maintenance	\$1,408,000
Crew	237,250
Fuel	14,608
Lubricating oil	<u>2,282</u>
Subtotal	\$1,662,140
Miscellaneous (4%)	66,460
Total	\$1,728,600

Operating costs for the hovercraft are dominated by the high maintenance costs. Annual operating costs for the hovercraft are considerably higher than for the high-speed, shallow-draft landing craft. Hovercraft service is faster and more frequent than the high-speed, shallow-draft landing craft, but the service improvements probably do not justify the increased operating cost.

Long-Term Charter Option: A bareboat charter of the AP.1-88 (current value \$1.5 million) is available at approximately \$1,000 per day, with a one year minimum charter required. This does not include crew or fuel costs. Charter costs for crew are estimated at \$2,200/day (3 man crew) and hourly operating cost (without fuel) is estimated at \$800/hour.

Shoreside Facility Requirements

It is feasible for the AP.1-88 to load and unload with minimal shoreside facilities if landing sites can be found that are relatively protected from wind and waves. A clear sloping beach is required. The character and cost of infrastructure improvements set forth in Table 44 are appropriate to hovercraft service as well as the high-speed, shallow-draft landing craft.

A maintenance building that can house the vehicle for service periods should be provided. This facility should preferably be at either the western terminus at Naknek or possibly at the eastern terminus at Pile Bay. Naknek is the largest community served and Pile Bay will presumably enjoy logistic support via ferry from Homer and overland via the Williamsport – Pile Bay road. Ideally, this building will have a concrete floor/pad. Alternatively, for short term service, there must be some temporary system to provide protection for the crew engaged in repairs to the skirt.

Frequency of Travel

The AP.1-88 hovercraft operates at speeds that make possible a daily round trip within the confines of a twelve-hour service day. The analysis of potential hovercraft service above assumes that the hovercraft operates five days per week except during spring thaw and winter freezeup.

Estimated Demand

HOVERCRAFT OPTION

Demand for this option has been estimated at 6,900 passengers and 2,400 vehicles per year.